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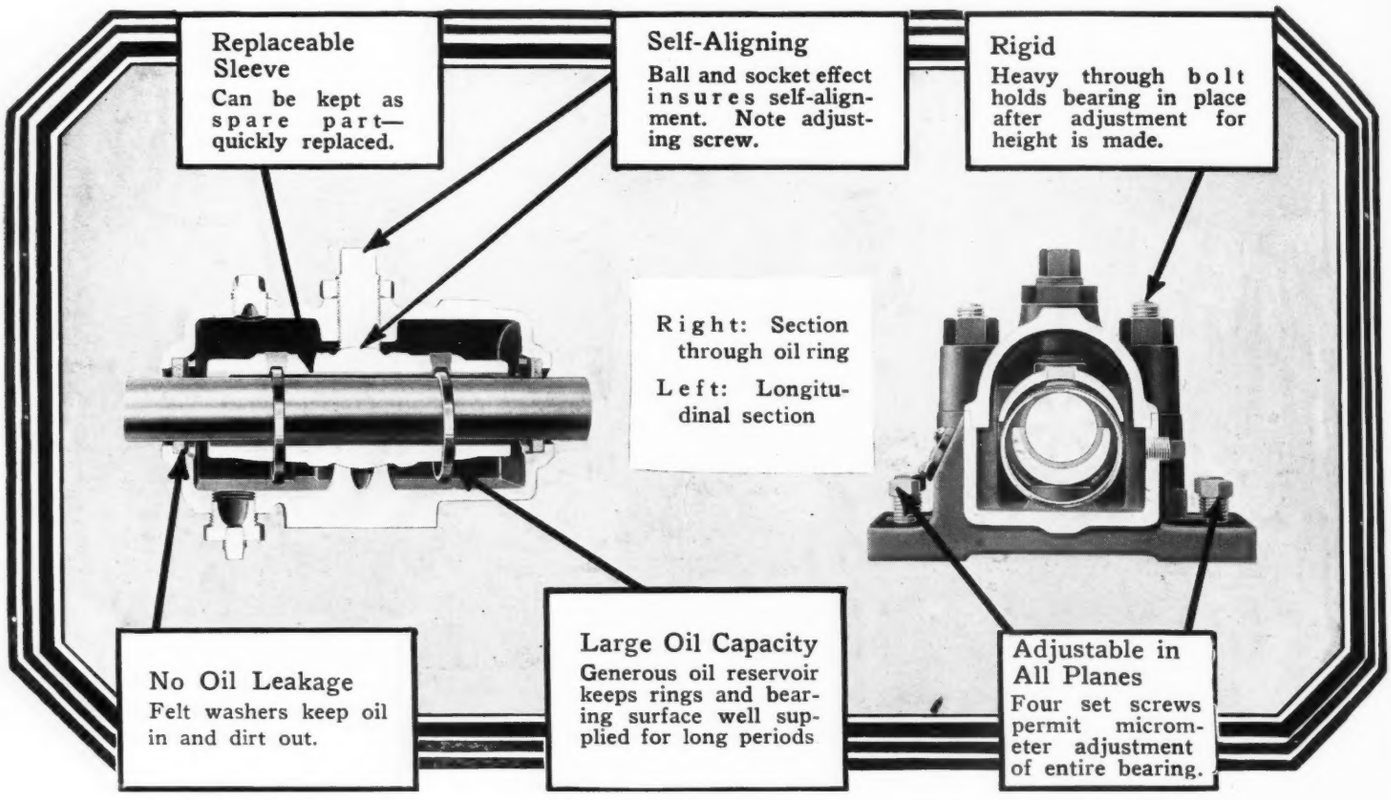
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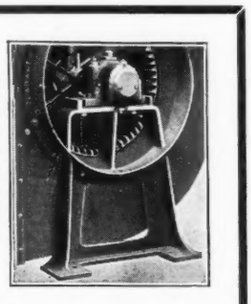

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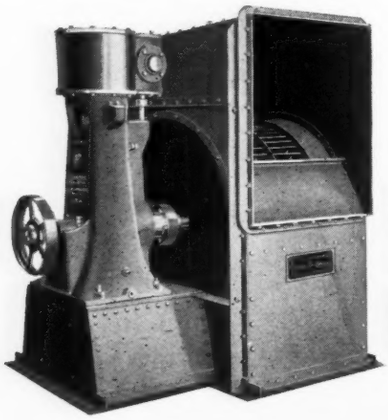

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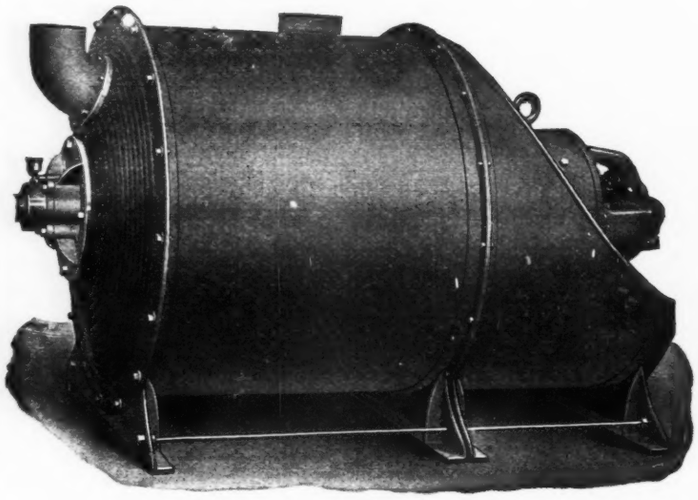

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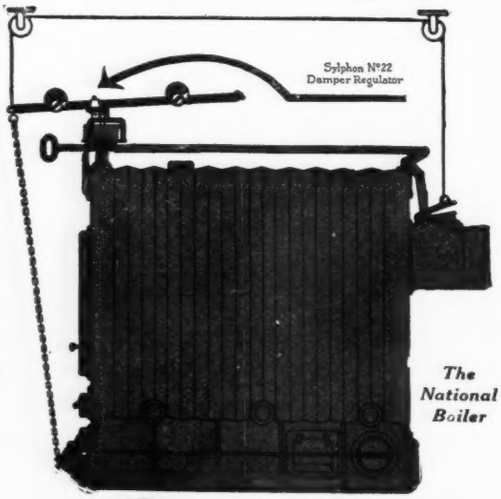

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DECEMBER, 1923

Air Conditioning System for a Modern Film Laboratory

Design and Operation of the Ventilating Equipment at the Plant of the Famous Players-Lasky Corporation, Hollywood, Cal.

BY FRANK E. GARBUTT

IN THE film laboratory of the Famous Players-Lasky Corporation, at Hollywood, Cal., the working departments of the building divide themselves into three clearly defined groups, limited by differences of operating requirements and conditions. The first group, which is designated as Group "A," consists of the rooms where the film is dried. The second group, which is designated as Group "B," consists of the rooms in which film is handled in the process of developing and manufacture aside from the dry rooms. The third group, which is designated as Group "C," consists of the office portions of the building and other departments where film is not handled during the process of developing or manufacture.

In the film-drying rooms, it is necessary to maintain conditions which will permit of rapid drying of the film without other effect. It is also necessary to maintain consistently comfortable conditions for the operators. The apparatus for this department consists of saturating air washer, dry filters, fan, heater coils and the control apparatus.

The air is drawn from out of doors, passed through the dry filters and air washers to the fan and distributed to the drying rooms and machines through a duct system, arranged to suit the drying apparatus. The necessity of continuous circulation and even distribution requiring a more elaborate duct system than usual. The dry filters average 200 mesh. The air is passed through the filter screens at a velocity of approximately 55 ft. per minute. This eliminates the larger particles of dust and dirt which might be drawn through the washer. The washer removes the rest of the dirt and saturates the air.

In this process, the dry-bulb temperature of the air is lowered to the approximate wet-bulb temperature, which will not exceed 72° F., except for a few days during the summer. The air is then forced through the heater coils by the fan and the temperature raised sufficiently so that the difference between wet and dry bulb is 18°.

This air is delivered to the rooms at the drums and machines. The rise in temperature, due to heat absorption through the outside walls, from lights, moving machinery and the people, further increases the dry-bulb temperature and the difference between the wet and dry bulb. The entire work in these rooms is done with a rise in wet-bulb temperature of approximately 10°.

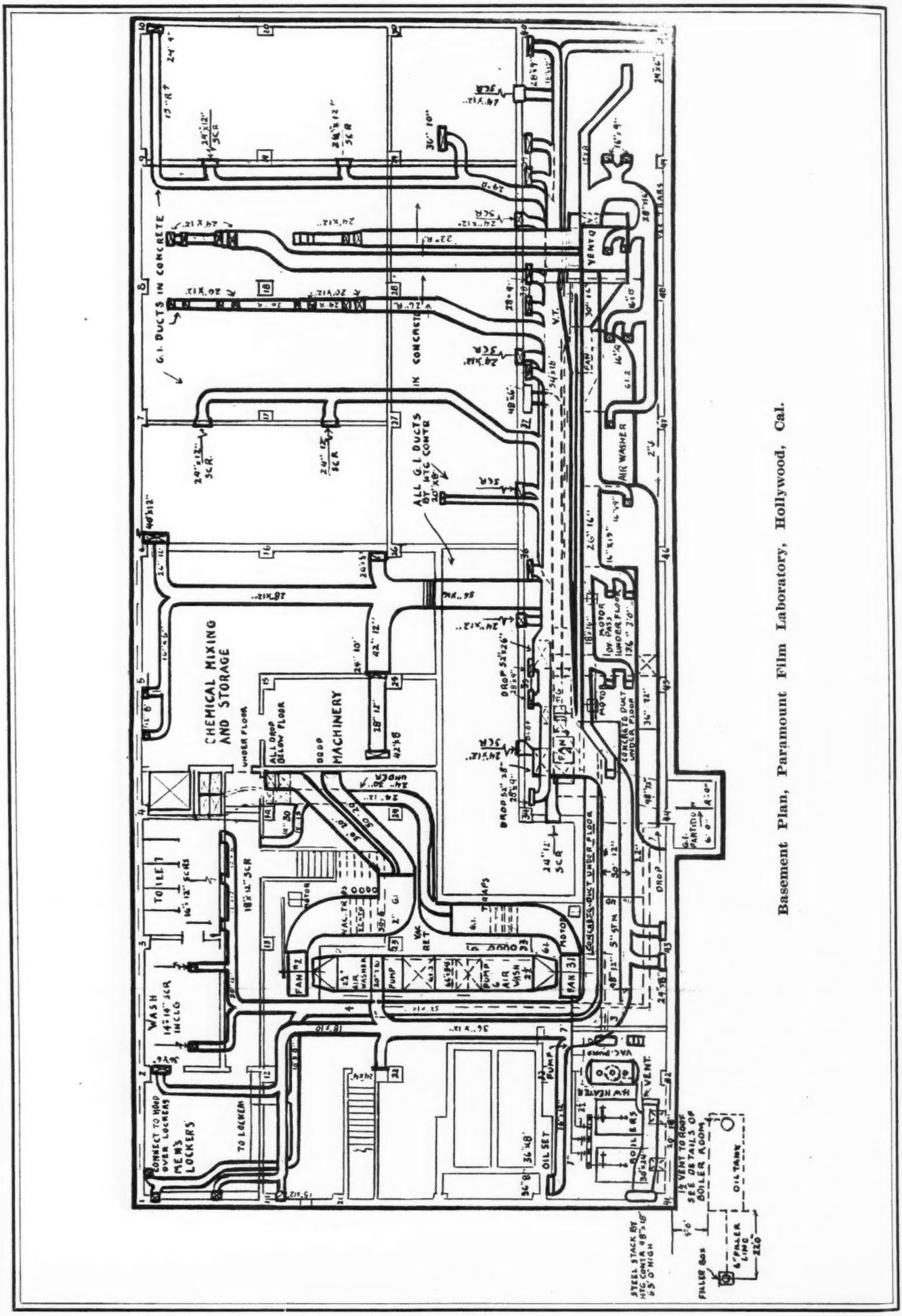
Under these conditions there will be an absorption from the total department equal to approximately 380 lbs. of water per hour, which means that we can dry effectively, under normal conditions, 300,000 ft. of film in an 8-hour day. Under pressure conditions, these amounts can be materially increased.

CONTROL APPARATUS

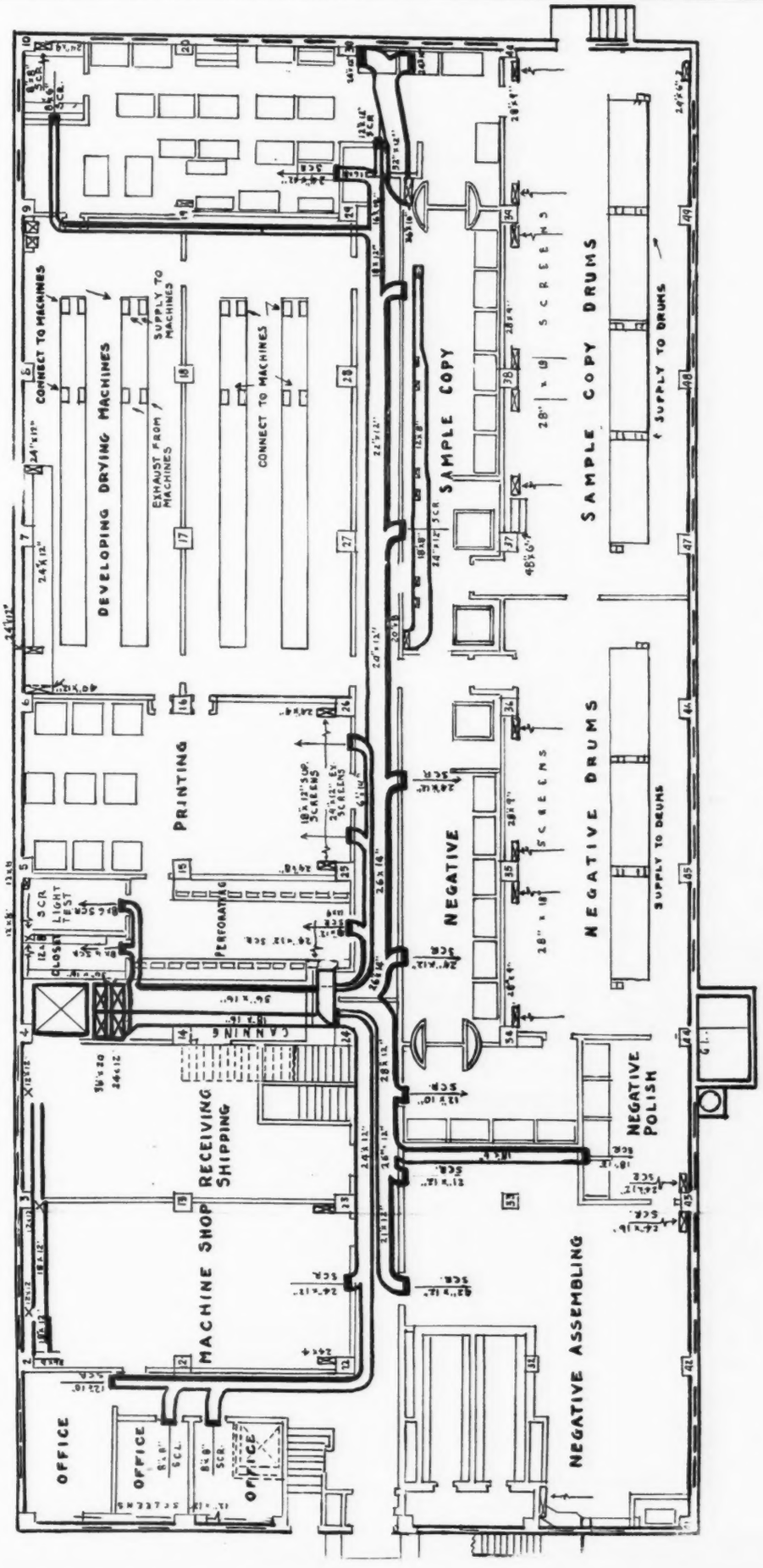
The control apparatus consists of automatic mixing dampers on the air ducts bearing the hot and cold air to the various parts of the system, in order to maintain constant dry-bulb temperatures. Wet-bulb control is provided at the air washer, varying the proportion of recirculated and fresh cold water to automatically maintain constant wet-bulb temperatures. In addition to these controls, a humidity control is provided on the recirculating system, which provides for a variation in the proportion of fresh outside air to recirculated air, which makes it possible to build up the humidity when unfavorable outside wet-bulb conditions require.

This apparatus provides for all conditions when the outside wet-bulb temperature is lower than the desired inside wet-bulb temperature. For times when the outside wet-bulb temperature is higher than that inside, provision is made for using refrigerated water or cold city water as desired, under which condition any desired temperatures and humidities can be maintained in the dry rooms.

The apparatus for this department includes the dry filter already mentioned, constructed in accordance with detailed specifications from our office; a Type "B" Carrier air washer with double banks of nozzles and elim-

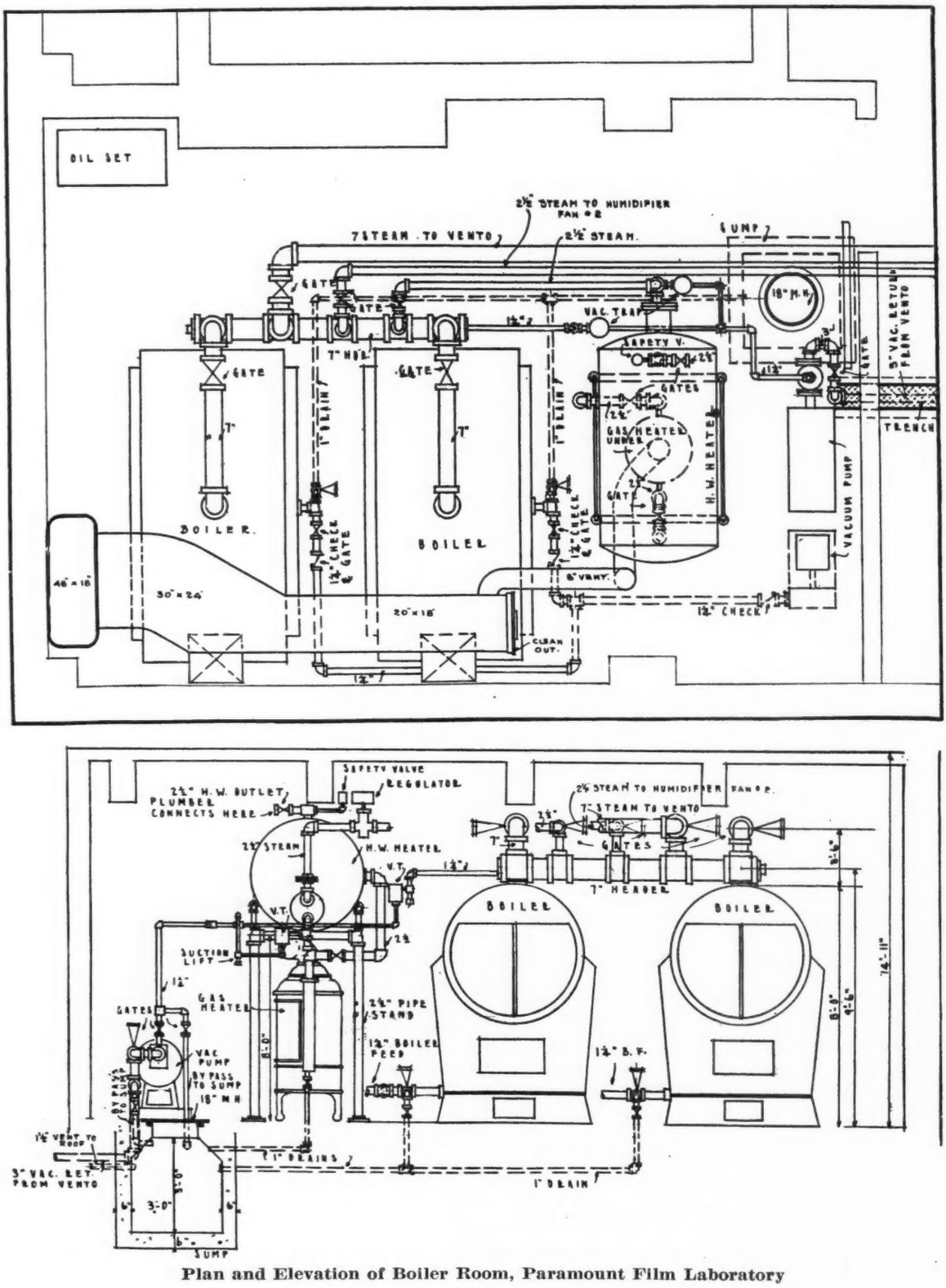


Basement Plan, Paramount Film Laboratory, Hollywood, Cal.



First Floor Plan, Paramount Film Laboratory, Hollywood, Cal.

inator flooding apparatus. This washer handles approximately 400 gals. of water per minute at 40 lbs. pressure; a Buffalo No. 10 Type "D" "Conoidal" fan, delivering approximately 38,000 cu. ft. of air per minute; heater coils consisting of 1400 sq. ft. of 72 in. Vento; control apparatus consisting of Johnson Service Company's thermostats and humidostats.

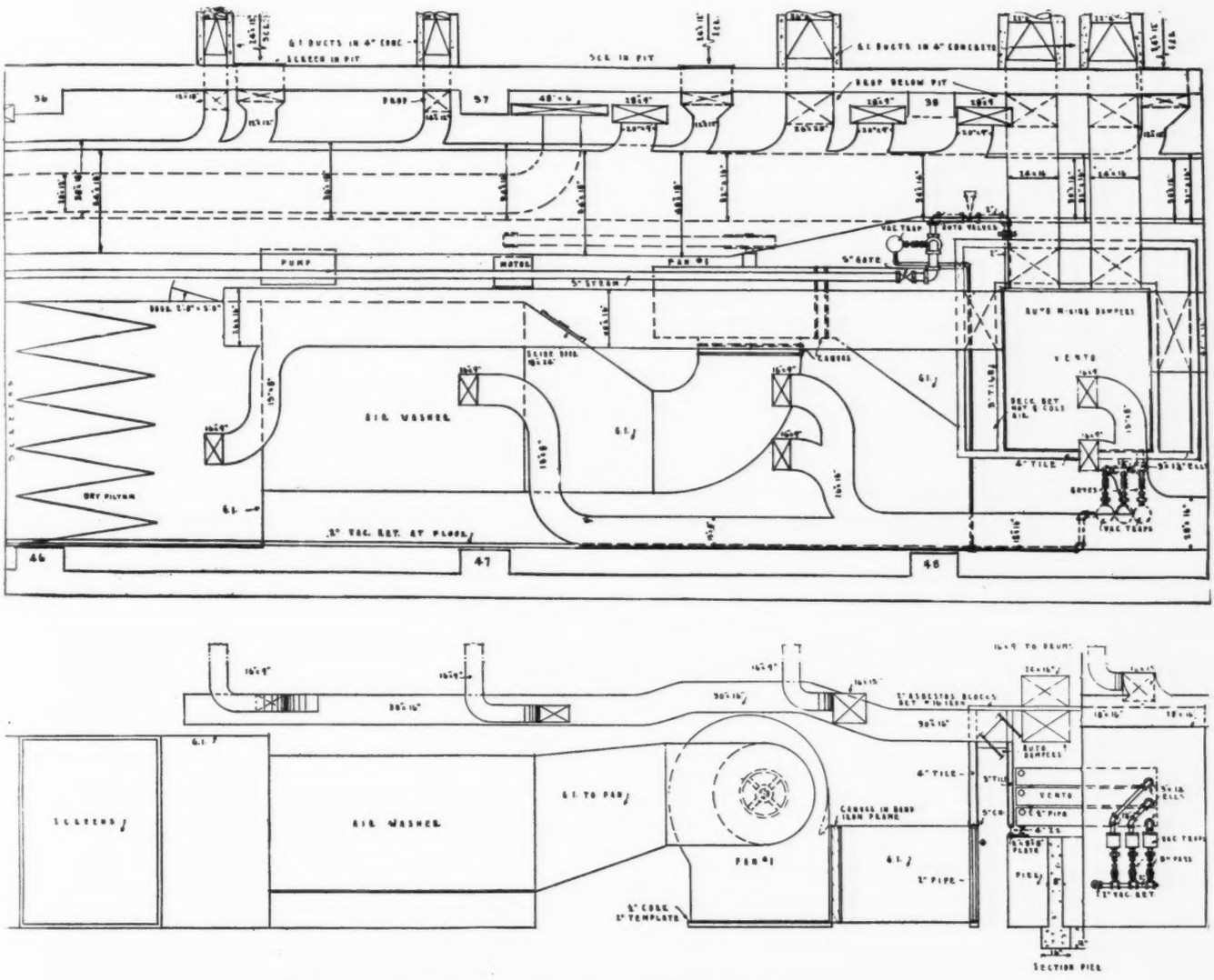


Plan and Elevation of Boiler Room, Paramount Film Laboratory

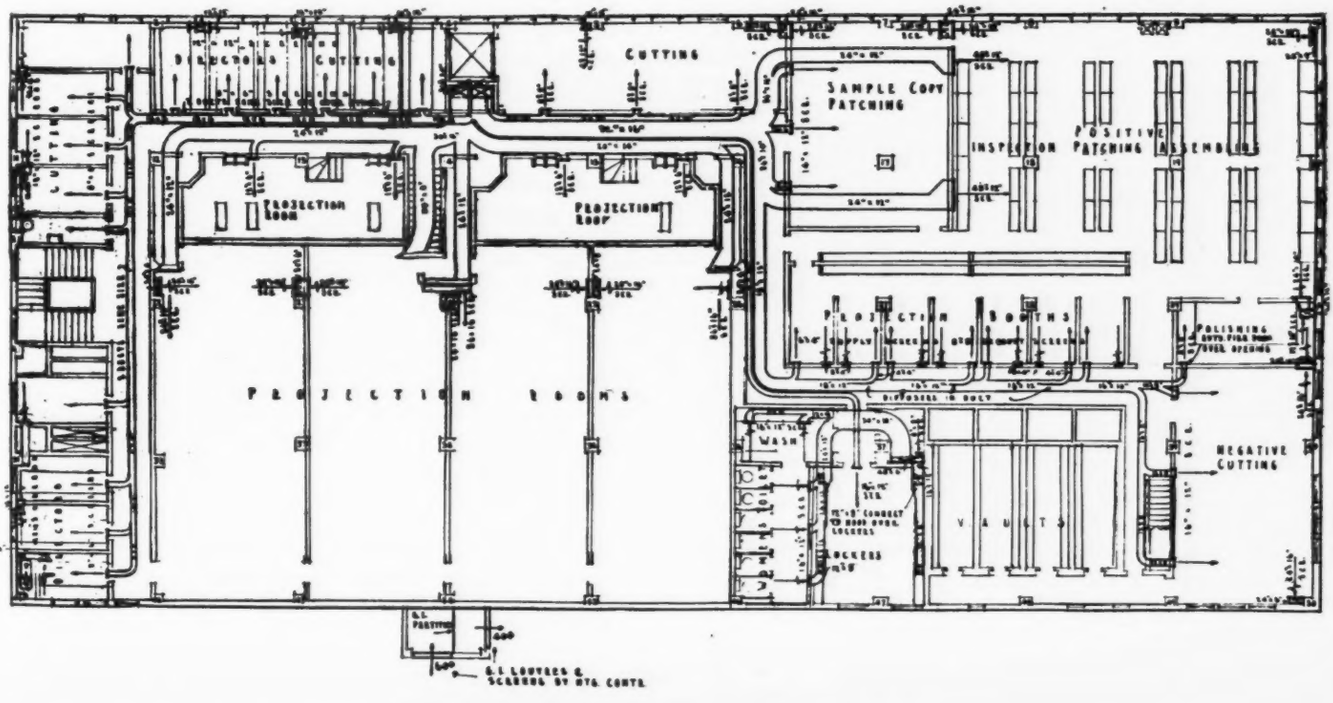
EQUIPMENT FOR GROUP "B"

Group "B" required apparatus to maintain wet-bulb temperature in the various departments such that the relative humidity would not be less than 60% and the dry-bulb temperature approximately 70°. The variation in the dry-bulb temperature depends on the variation in the outside wet-bulb temperature. The apparatus consists of a Carrier Class "A" washer with dewpoint control; a Buffalo No. 9 type "D" "Conoidal" fan, delivering approximately 28,000 cu. ft. of air per minute and the Johnson Service Company's temperature control.

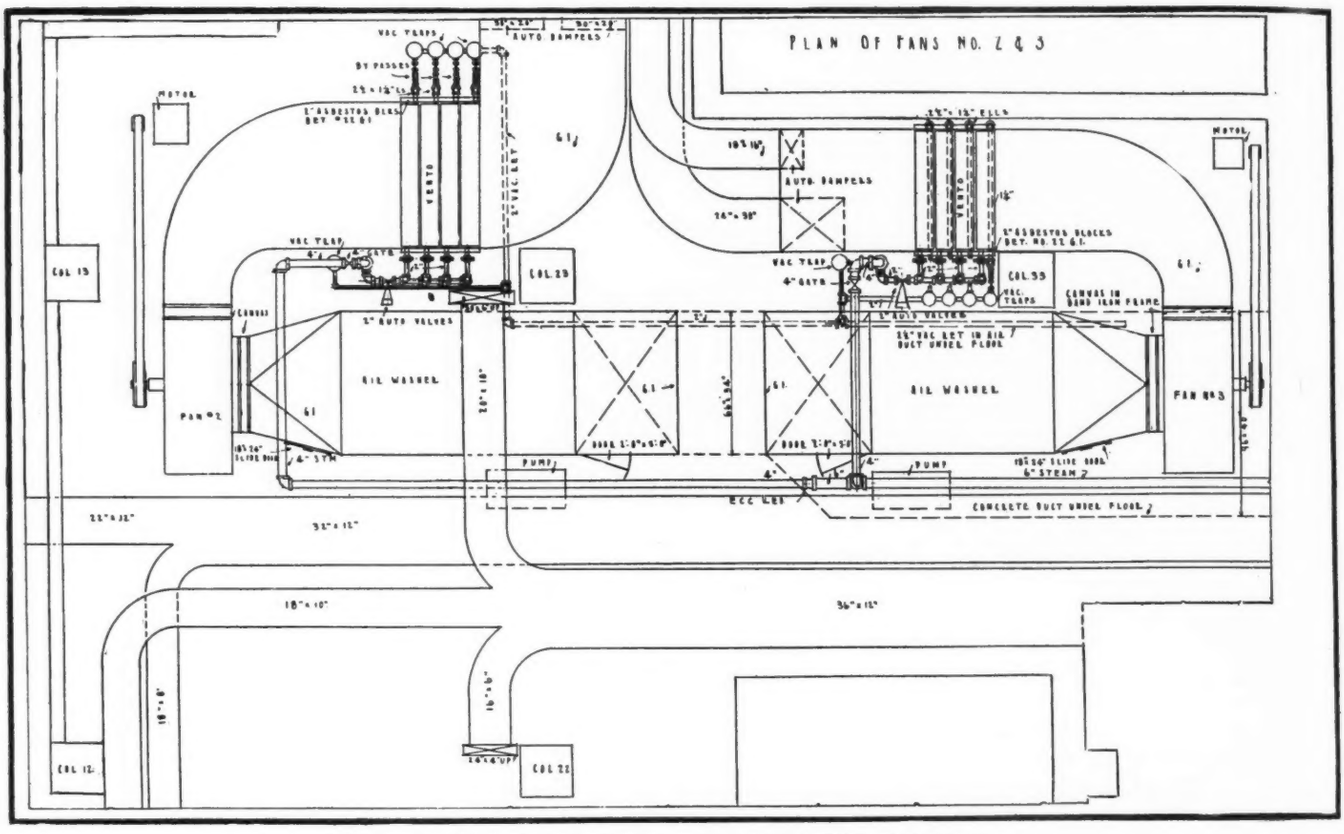
Provision is made in this equipment for circulating



Plan and Elevation of Fan No. 1, Paramount Film Laboratory



Second Floor Plan, Paramount Film Laboratory



Plan of Fans Nos. 2 and 3, Paramount Film Laboratory

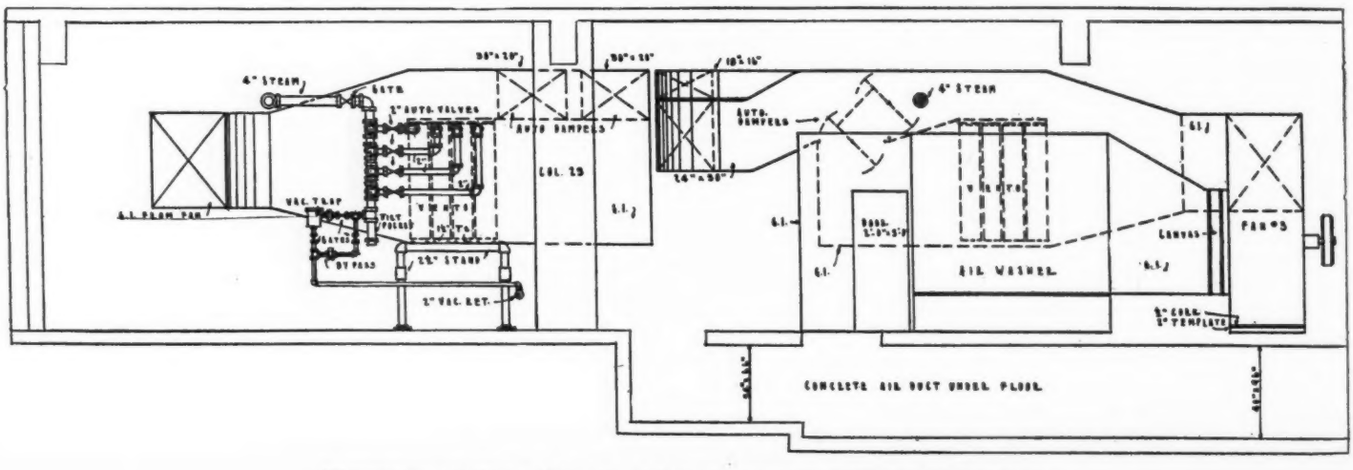
raw city water when the temperature of the water is lower than the outside wet-bulb temperature. The temperatures and humidities are automatically controlled in the various departments within the limits of the apparatus. Special provision is made for circulating refrigerated water through the washer, under which conditions any desired temperature and humidities can be maintained. The humidity control is accomplished by varying the temperature of the water used in the washer, and the dry-bulb temperature is controlled by mixing dampers varying the proportion of the hot and cold air.

Group "C" departments are taken care of by apparatus consisting of Carrier Type "C" washers and No. 8 Buffalo Type "D" "Conoidal" fan, delivering approximately 25,000 cu. ft. of air per minute. The requirements of the rooms in this group are clean air, good ventilation and as low a temperature as possible with the apparatus. There is no humidity control provided, but temperature control by means of Johnson Service Company's balanced dampers varying the proportion of hot and cold air. The control affects the conditions only when heat is on.

Group "A" is provided with an exhaust fan, handling 75% of the air furnished by the supply fan. Groups "B" and "C" are also provided with an exhaust fan, which takes care of 75% of the combined capacity of the supply fans. The exhaust fan for group "A" discharges outdoors or through the circulating system to the supply fan. The exhaust fan for groups "B" and "C" discharges directly out doors.

The apparatus delivers air in sufficient quantities to provide the following changes. Group "A," complete change every two minutes; Groups "B" and "C" complete change every six minutes.

The ventilating system here described was designed by the writer, in collaboration with the architect, Edwin Bergstrom, of Hollywood.



Elevation of Fans Nos. 2 and 3, Paramount Film Laboratory

Problems Affecting Hot Water Piping and Fittings in Heating Plants

With Special Reference to Gravity Two-Pipe Systems with Overhead Supply and to Equalization of Water Flow Through Riser and Drop Piping

BY S. HOMER WOODBRIDGE

IN THE case of gravity circulation through a two-pipe system, with overhead supply and down feed to radiators, and with under-foot return and pipe drops from radiators to the return main, difficulty has not uncommonly been experienced in obtaining or maintaining the desired circulation through the lower members of the system, largely because supply and return mains are not duly proportioned with reference to the hydraulic head required to escape that embarrassment in circulation.

Without any purpose or attempt to discuss the principles and laws upon which a correct solution of circulatory problems must be based, a single case involving the principal factors under present consideration will be here noticed.

The situation under consideration may be illustrated by a sketch, Fig. 1., showing a vertical series of four radiators connected in the manner indicated with the overhead supply main, S, and with the under-foot return main, R. If the supply and return drops, and also the runouts to radiators are rightly proportioned, and if the supply and return mains are correctly sized for a gradient represented by the two factors, first, of the total length of the circulation circuit and, second, by a hydraulic head found by the difference in the temperatures between the supply entering and the return leaving the bottommost radiator, and the height of the middle of that radiator above the return main, the circulation would then be satisfactory through each radiator of each group. But if, as is more commonly the case, the mains are given a smaller size than is needed for carrying a full body of water through them under a gradient as small as that just indicated, an embarrassment results which is increasingly manifest from the topmost to the bottommost radiator.

ANALYSIS OF THE PROBLEM

Let it be assumed that the temperature of the water in the supply main and drop is maintained at 180° F. and that under conditions of normal or equal flow through the radiators, and because of the size and pattern and exposure of the radiators, a drop of 20° in the temperature of water flow takes place in the case of each radiator.

Flow is the result of unbalanced pressure, and is in the direction of action of the major pressure. Chilled water of equal volume, or in equal column, is heavier than the same volume of warmer water, and therefore produces greater pressure. In the case of the topmost radiator, 1, the excess of weight in the return pipe, A', B', over that in the supply pipe of equivalent height, A, B, causes an assured flow through radiator 1. But that excess weight in A' B' makes against a like or unimpeded flow through radiator 2. Consequently, because of slower flow through radiator 2, the water is longer retained in that radiator than in radiator 1 and is consequently cooled not to a normal 160°, but to possibly 150°. That would mean that the temperature of water in column B' C' perhaps is at 155°. Thus the mean temperature of the column A' C' and the consequent pressure become such as to still further reduce the rate of flow through radiator 3 and to cause a further fall in the temperature of the water issuing from that

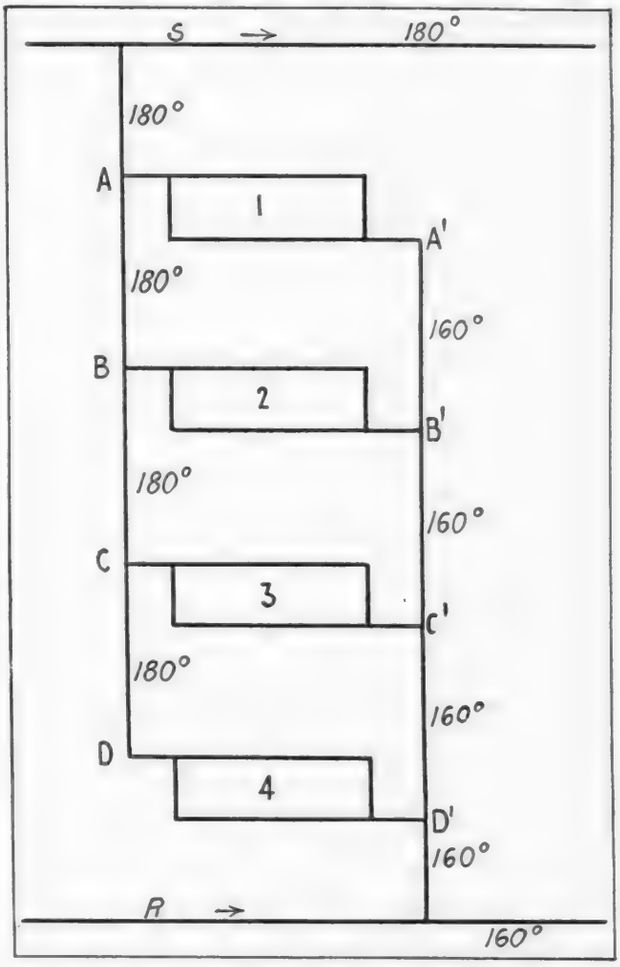


Fig. 1—Vertical Series of Four Radiators with Overhead Supply Mains

The accompanying paper deals principally with certain situations which have arisen in the experience of the writer in planning and installing water heating systems under both gravity and forced circulation. The discussion relates to certain definite problems and to the several factors entering into them, and to the manner of applying the constituent factors to the method of problem solution. In hot water practice the field is more prolific of problems and affecting factors than in the case of steam, and in piping for hot water service there are likely to be more partial or total failures than in the case of steam.

radiator. The cumulative effect may here, in radiator 3, be such as to suspend flow in a normal direction, with varying conditions so changing pressures as to result in spasmodic retardation, suspension, reversal, and occasional restoration of normal flow.

In the case of radiator 4, and under performance conditions just described, the probabilities of cumulative excess of weight in the return column favor a perpetual reversal of flow, and a more or less continuous fluctuation of irregularities in the functioning of all radiators, except than of 1, in the case under consideration.

Such trouble is increased as the water way below D′ in the return is for any reason or in any manner restricted, or if a similar restriction occurs above A in the supply piping.

One remedy for such disorders has already been suggested, namely, in so increasing the sizes of the supply and return mains as to remove all flow restricting effect. Resort to that method is sometimes impracticable, and is generally more costly than that to be now desired.

USE OF MODULATING VALVES AS OBSTRUCTIONS TO FLOW

Complete obstruction at any point between A and B′ would manifestly remove all pressure, under approximately 15 lbs. to the square inch at point B′. If any where between A and B′ there be provided an obstruction to flow so gauged as to reduce the pressure at B′ to such an extent as to remove the excess of pressure which before interfered with the free flow of water through radiator 2, and if a like retarding device be placed anywhere between B and C′, such as to produce a like effect on the rate of water flow through radiator 3, the results sought in these radiators 1, 2, 3 and 4 may be obtained at a relatively small cost of material and labor. Such obstruction cannot be properly effected by use of pipe sizes, since the carrying capacities of pipes vary as diameters raised to 2½ power, whereas in actual

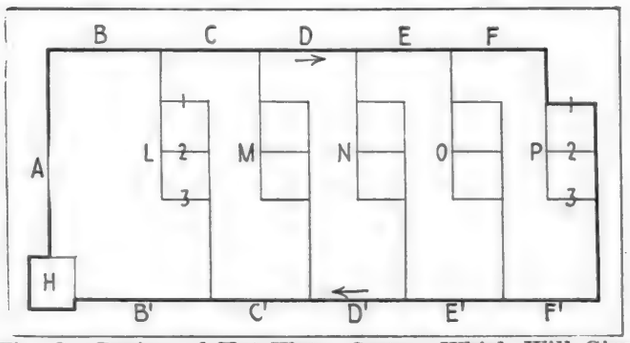


Fig. 2—Design of Hot Water System Which Will Give Inequalities of Flow

practice the adjustment in many cases must be surprisingly fine if results are to be those wanted.

The writer has successfully used for this purpose forms of modulating valves which admit of fine and fixed adjustment, and which by construction are proof against tampering and changed setting under whatever motive. In the case of seven to eight-story buildings it has been found necessary, in order to insure needed circulation through first, second and third-floor radiators in an overhead-feed water heating system, to throttle down the valves of the uppermost radiators to an almost unbelievable degree, but always with results wholly satisfactory and in completeness and economy not obtainable by piping adaptation through attempts at uniformity of circulation by frictional resistance sizes and lengths of pipe line.

EQUALIZATION OF WATER FLOW THROUGH RISER AND DROP PIPING

In the case of runs of supply and return or distributing and collecting mains with groups of radiators, or other types of heaters, connected between them for water flow, very much in the matter of equality of water distribution and flow may depend on the manner of piping the mains. That matter becomes the more important as the lengths of mains increase, whether the circulation is caused by gravity or applied mechanical action.

The first condition to be considered is that of the effects

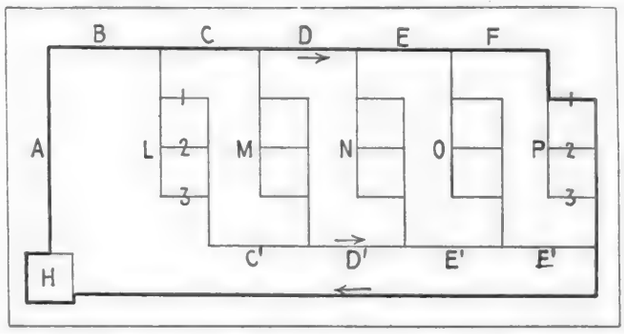


Fig. 3—Design to Overcome Inequalities of Flow in a Hot Water System

of reversed and of concurrent flow of water in the two mains between which are the series of radiators and their connection.

For the purpose of simplicity of figure, construction and discussion let reference be made to Figs. 2 and 3.

In Fig. 2 let H represent the heat source and A the main riser assumedly 40 ft. in height, and let B, C, D, E and F represent five sections of the main supply piping each 40 ft. in length and let B′, C′, D′, E′ and F′ represent equal lengths of sections in the return main, all, for practical purposes, 30 ft. in length. The directions of water flow are indicated by the arrow. The following table indicates the lengths of piping for water travel for each of the five groups of radiators and their riser and drop piping as connected between the two mains.

Group L $40 + 30 + 40 + 30 = 140$

Group M $40 + 30 + 30 + 40 + 30 + 30 = 200$

Group N $40 + 30 + 30 + 30 + 40 + 30 + 30 + 30 = 260$

Group O $40 + 30 + 30 + 30 + 30 + 40 + 30 + 30 + 30 + 30 = 320$

Group P $40 + 30 + 30 + 30 + 30 + 30 + 40 + 30 + 30 + 30 + 30 + 30 = 380$

Unless the sizes of mains are especially and successfully proportioned to compensate for frictional effects, the friction of flow increases from L to P in the ratios of 100 to 143 for M, 186 for N, 229 for O, 269 for P. Since the rates of flow are approximately inversely as the resistance, the rate through group L being 100, that through M would fall to 70%, that through N to 54%, that through O to 44% and that through P to 37%, corrections not being made for frictional effect due to reduced rate of flow. In practice such damaging ratios would be seldom, if ever, encountered, because compensating factors in pipe sizes would be used by experienced designing engineers, if not by contractors.

METHOD OF PREVENTING INEQUALITIES OF FLOW

The question for the present consideration refers to the simplest and surest method of preventing such inequalities of action in flow as have been mentioned. The method indicated in Fig. 3 offers the merits of both simplicity and effectiveness and gives to each group number of the system the same resistance factor namely, 40 – 30 – 40 – 30 – 30 – 30 – 30 – 150 — 310.

The basal rule in this method of solution is that of concurrent flow of both supply and return through all mains between which are connected the radiator groups L, M, N, O, P, or whatever the number of groups may be. The method has been applied to systems of gravity circulation including from 12 to 50 radiator groups, and to forced circulation systems for nearly 150 radiator groups between supply and return mains.

In addition to the method for securing equality of flow in the manner just described is that of so proportioning pipe sizes in mains to the sizes in supply and return piping connecting the radiators in the several groups, that the hydraulic head in the mains shall be so much less than that in the cross-connecting piping that equality of flow through the connecting piping and radiators shall be, as nearly as practicable, uniform. That condition and state of flow would be most nearly realized when the hydraulic state in both mains is static.

To effect that state in mains is manifestly impracticable because of the sizes of pipe mains necessary to effect that condition. But, if the gradient (the ratio of hydraulic head expressed in any unit to the total length expressed in the same unit of the complete circulatory circuit, h/L, both h and L being expressed in the same unit) in the mains is made perhaps 1/150, and the gradient for the piping between and connecting the mains is made 1/50, a long and effective step is taken for insuring equality of flow through all of the pipe and radiator groups between the mains.

Could pipe sizes be proportioned with exactness to the requirements of each group, equality of flow through all groups might be made exact and absolute. But the carrying capacity of pipes so increases with diameters, with leaps and bounds, that sole reliance on the method of insurance flow control by use of pipe sizes chosen for the purpose is not safe if any approach to exactness of equality in flow is sought.

It has, therefore, been the practice of the writer to place in either the supply or the return piping between the connecting mains a lock-shield valve for adjusting the rate of flow between rates controllable by pipe sizes.

The several methods thus far noted have been successfully applied to designing, installation and performance of water heating systems, ranging from 1,000 to 70,000 or more square feet of radiating surface, and are recommended without reservation for general adoption.

INSURING WATER FLOW THROUGH LARGE RADIATORS WITH ONE-PIPE CONNECTIONS

Closely akin to matters of equality of circulation through extensive or otherwise complex systems of piping is that of insuring activity of water flow through large radiators when they are of one-pipe connection and of large size and of exceptional length. In the case of the New National Museum Building, Washington, the nature of wall construction and the appropriation of a full half of all permissible chase ways for electrical cables and other furnishment made it absolutely and reluctantly necessary to supply and drain each of the some 500 radiators through one-pipe connections, most of the radiators exceeding 40 sections, and many reaching 50 sections in length. Each drop from the attic supply is connected with from four to five radiators on the successive floors.

CONDITIONS IN THE NEW NATIONAL MUSEUM BUILDING

The situation made it necessary not only that these radiators, of such unusual size and length, should be not only single piped but that hot and chilled water connections must be made at one and the same end of every radiator. From that situation there was no escape. The situation was accepted as inevitable, but appeared so hazardous as to elicit foretellings of failure. No precedent or experimental proof was found available; nothing better than applied and, up to date, unproved "theory" was left to build assurance upon.

The theory accepted was based on the following obvious conditions, each contributing its measure to sureness of circulation of water within each radiator. First, the hotter water in the pipe and the cooler water within the radiator connected at top and bottom with that pipe and with a difference of 10° in a height of 24 in. for the radiators of least height *must* produce a flow head equivalent to a pressure represented in 1/5 in. water column. Second, by as much as the water flow through a single pipe with which the radiator is connected is made swift, by diverting that flow in part through the radiator by the use of Y tees (the Y for inflow looking downward and that for outflow looking up) a water flow through the radiator *must* be assured, even though there be no difference in the temperature between radiator and pipe water. Third, the swifter the flow of water through the pipes, the greater the "head" pressure difference between the two points of pipe connection with the radiator. If the distance between the two connecting Y points is 30 in. for a 24-in. high radiator, and the gradient for the pipe flow is 1/40, then the flow producing pressure difference between the open ends of the connecting piping is equal to a column of water of ¾ in.

Of the three causes contributing to produce flow, the first, due to expansion effect, is of least value, perhaps reaching a maximum of 4/20 in. water column; the second, due to the diverting of current, may reach a water column value of possibly 8/20 in.; the third, due to hydraulic, or gradient, head, is computed to have a value of 15/20 in. water column, making a total of 27/20 in. water column combining to insure abundant flow.

The frictional resistance to flow through the longest radiator, approximating 130 in. is low because of the large aggregate area of water way within the radiator and the slow rate of flow. Through a pipe 1½ in. in diameter and 10 ft. long a head of 1 in. water column would produce a flow of nearly 600 gal. per hour. The rapidity of flow through the radiators under the ordinary working conditions of forced circulation produces an evenness of water temperature within the radiators.

When tested under conditions of gravity circulation, the rate of flow throughout the system was found to be unexpectedly uniform, all drops heating to practically the same degree, the successive downward radiators being distinctly cooler from top to bottom of the building because of the inevitable sluggishness of water flow.

New Central Heating Plant of Queen's University and Kingston General Hospital

Development of a Combination Steam and Hot Water Supply for Two Separate Groups of Buildings Requiring 1800 Ft. of Underground Conduit

BY L. M. ARKLEY and W. P. WILGAR*

IN 1921 the load on the old central heating and power plant of Queen's University was found to have exceeded its capacity. About the same time the authorities in charge of the Kingston General Hospital decided to change from the individual boiler method of heating, then in use, to the central plant method. On account of the proximity of the buildings of these two institutions, it was apparent that a central plant could be built to accommodate them both, the alternate scheme being for Queen's to enlarge the old central plant in Fleming Hall and for the hospital to build a central plant of its own.

After careful estimates had been made of the probable initial cost and future operating costs of the two schemes, it was decided to build a central plant to serve both institutions and a suitable site was purchased, on the water front, directly south of the university grounds.

The main advantages of the joint central plant, from the standpoint of the university are, first, the removal from the campus of a power plant from which a certain amount of smoke, gas and dust was always giving trouble, and second, the releasing of valuable space required for classrooms and laboratories. The chief advantage to the hospital lies in the removal of twelve individual hand-fired boilers with their attendant dirt and the constant attention required to keep them going. Both institutions reap the benefit of having the central plant located on the water front where coal can be unloaded directly from barges or coal boats, and where an abundance of water can be easily obtained from the lake, suitable for all except drinking purposes.

When it was decided to remove all the boilers from Fleming Hall, it brought up the question of the steam engineering or thermodynamics laboratory, and it was decided to move all steam equipment from Fleming Hall and build a laboratory in connection with the central plant to house it. The removal of this equipment has relieved the congestion in the internal combustion engine laboratories and made room for much needed extensions to the electrical laboratories.

The central heating plant was designed to heat and light the following buildings which are shown on ground plan in Fig. 1.

No. of building		Name of building	No. of sq. ft. of radiation
1		Power House	
		Hospital Group	
2		Hydraulic Laboratory	
3		Isolation Hospital	5049 Hot water
4		Laundry	720 Hot water
5	(Proposed)	New Ward Building	.....
6		Service Building	2850 Hot water
7		Empire Wing	3730 Steam
8		Nurses Home	1690 Hot-water
9		Main Building	9380 Hot water
10		Doran Wing	
		University Group	
11		Theological Building	3710 Steam direct
12		Kingston Hall	4580 Steam direct 1000 Steam indirect
12a		Grant Hall	1712 Steam direct
13		Ontario Hall	3626 Steam direct 1000 Steam indirect
14		Fleming Hall	2150 Steam direct 540 Steam indirect
15		Carruthers Hall	2060 Steam direct
16		Gordon Hall	3766 Steam direct 1000 Steam indirect
17		Residences	
18		Mill	550 Steam direct
19		Gymnasium	1638 Steam direct
20		New Medical Building	1776 Steam direct 280 Steam indirect
21		Douglas Library	.... Steam direct .... Steam indirect
22		Mechanical Laboratory	355 Steam direct
23		Jock Harty Arena	1600 Steam direct
24		Gordon Hall	3766 Steam direct 1000 Steam indirect
25		Nicol Hall	2335 Steam direct 1000 Steam indirect

All the university buildings are heated by means of low-pressure steam. The new library and the Jock Harty rink use the vacuum return system while all the other buildings use the old one-pipe gravity return system. The returns flow by gravity to Fleming Hall and are trapped from this point to the 4-in. return pipe leading to the vacuum pump in the central plant. The vacuum pump delivers them to the feed-water heater which serves as a hot well from which the boiler feed pumps draw their supply.

The hospital buildings are heated by means of hot water, circulated from the central plant, with the exception of the Empire wing which has a steam gravity return system. It is proposed to change this in the near future and to connect it to the hot water system.

Details now available of the extensive central heating plant of Queen's University and Kingston General Hospital show it to be a remarkable installation, even for these days of large group heating projects. The accompanying description of this interesting plant was presented before the Kingston Branch of the Engineering Institute of Canada, by Professor L. M. Arkley and Colonel W. P. Wilgar, and published in the Engineering Journal of the Institute for November, 1923. Included in the paper as presented is a detailed description of the power house, including the generating equipment, and the equipment of the boiler room etc., together with an account of the method used for coal handling and storage. The paper concludes with details of the remarkable equipment and facilities of the steam engineering laboratory at Queen's University. The engineers for the work were Melvern F. Thomas, who is well known in heating and ventilating engineering circles; Colonel W. P. Wilgar and Professor L. M. Arkley. The architects were Messrs. Power and Drever.

* Professor Arkley is professor of mechanical engineering in Queen's University, Kingston, Ont., and Colonel W. P. Wilgar is also a professor there.

THE POWER HOUSE

As shown in Fig. 1 the power house is located on the water front south of King street, on what was formerly a knitting mill site. The engine room and the thermodynamics laboratory face King street and this part of the building is 40 ft. wide by 144 ft. long, the eastern half being the engine room. The boiler room extends south from the main building and is 48 ft. wide by 80 ft. 6 in. long.

It has been found economical to use city power when the heating load is off in the summer. City current is supplied through a 37½-K. W. transformer and the voltage reduced from 2,200 to 110-220; by means of a motor generator set, direct current may be obtained when required.

The pumping equipment consists of five steam-driven reciprocating pumps, two centrifugal steam turbine-driven pumps and three motor-driven pumps. There are two duplex Hepburn boiler-feed pumps, one 7½ in. by 4½ in. by 10 in., of 3,700 gal. per minute capacity, and the other 10 in. by 6 in. by 12 in., of 6,500 gal. per minute capacity. These are of the outside-end packed-plunger type and while they require a little more steam to operate them than the ordinary plunger pump, this is offset by the ease with which they are kept in repair. The vacuum pump is a 7-in. by 8-in. by 9-in. Northey steam pump and operates at a vacuum of 10 in. on the return line from Fleming Hall.

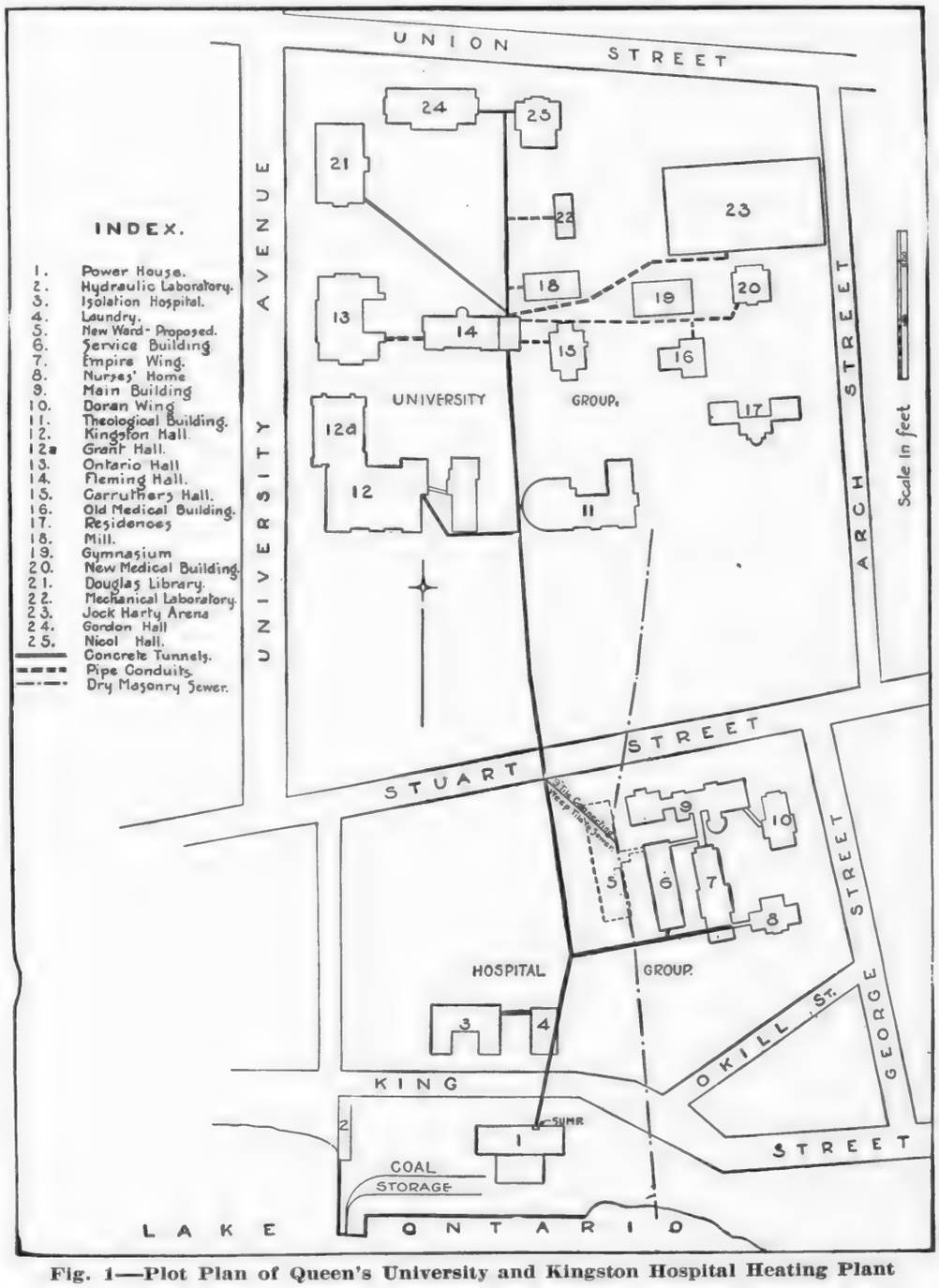


Fig. 1—Plot Plan of Queen's University and Kingston Hospital Heating Plant

All raw water used in the power plant and laboratory, except for drinking purposes is pumped directly from the lake to a 4,500-gal. tank located in the boiler room, and is distributed, from there, at 40 lbs. pressure. The pump used for this purpose is a 6-in. by 4-in. by 6-in. duplex Worthington. Connected to this intake pipe also is a

16-in. by 9-in. by 12-in. fire pump which can be used for either fire or service purposes.

The hot water which heats the hospital buildings is pumped by two centrifugal pumps directly connected to steam turbines. One unit is a Kerr steam turbine of 15 horse power, running at 2,100 R. P. M., directly connected to a centrifugal pump capable of pumping 350 gal. per minute against a head of 60 ft. The second unit is exactly the same as above, but the turbine is a Terry.

One of these units is large enough to do the work at present, the other being kept as a spare unit, it is therefore always available for use as a laboratory machine. Both machines are furnished with a flanged brake wheel, and a coupling in the shaft between the wheel and the pump allows the pump to be disconnected when an efficiency test of the turbine is to be made.

In a short time it is hoped to have a meter installed in the 6-in. hot water line to the hospital, when the turbine and pump will be available for testing as a combined unit. The above illustrates the advantage of having the steam laboratory connected with the power plant, in fact, as far as the students at Queen's are concerned the whole building is one large laboratory and this is made possible by close co-operation between the central plant and laboratory staffs.

Besides furnishing hot water for heating the hospital buildings, all service water for wash bowls, bath tubs, etc., is supplied from the central plant by means of two small centrifugal pumps driven by motors, the motors are Century single-phase, of ½-H. P., running at 1,750 R. P. M., and the pumps have a capacity of 20-gal. per minute pumping against a 20-ft. head.

As the lower end of the tunnel where it enters the power house is below lake level, it was decided to put in a sump at this point and a pump to take care of any leakage. This pump is a three-plunger power pump geared directly to a 5-H. P., motor.

WATER HEATERS

The feed-water heater is of the Cochrane open type and of 2,000 boiler horse power capacity. It is connected to the 12-in. main exhaust pipe from the engines, and by means of a back-pressure valve on the heater, the pressure on the heating system is regulated.

The heaters which furnish the hot water for heating the hospital buildings and the service water are made on the principle of a surface condenser. They consist of a circular cast-iron shell with a large number of small tubes placed inside. These are arranged so that the water to be heated passes through the tubes while the exhaust steam circulates between the tubes and the cast-iron shell. During the process the steam is condensed, drawn off and fed to the boilers while the water is circulated through the hospital by the small pumps described above. The temperature of both the water for heating and the service water is under thermostatic control, the system being that installed by the Power's Regulator Company.

In mild winter weather a water temperature of 120° F., when leaving the central plant and returning at 105° F., will keep the buildings quite comfortable, while in real cold weather these temperatures must be increased to say 190° F., and 170° F., respectively. A simple hand adjustment is all that is required to make this change.

OPERATION OF TEMPERATURE CONTROL FOR HOT WATER SYSTEM

Briefly the system operates as follows:— The temperature of the water coming from the heater will be proportional to the quantity of exhaust steam let into it, this quantity is controlled by a diaphragm valve which is in turn controlled by compressed air at about 15 lbs. per square inch. Now the air pressure acting to open the diaphragm valve against a spring is governed by the thermostat placed in the out-going hot water line. If the temperature of the water tends to rise the thermostatic valve closes, reduces the air pressure acting on the steam valve which slightly closes and thus keeps the temperature of the water uniform.

THE PIPING SYSTEM

There are four main considerations which govern the design of any steam piping system.

(1) As soon as steam leaves the boiler it begins to lose heat by radiation and therefore the pipes should be thoroughly lagged with a good insulating material. The thickness of this insulation is governed by the heat saving effected per inch thickness and the cost of application of the same. There is a certain point at which the interest and depreciation on the investment will just equal the saving due to the insulation.

(2) Water of condensation is always present in a

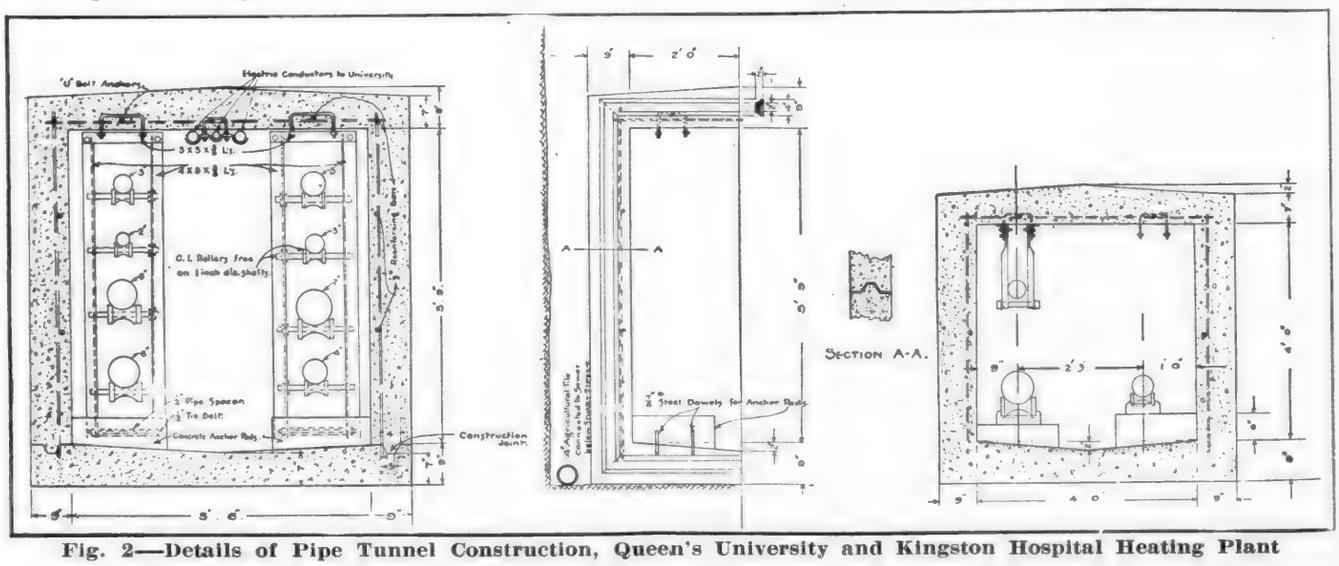


Fig. 2—Details of Pipe Tunnel Construction, Queen's University and Kingston Hospital Heating Plant

piping layout of any length and this must be removed or serious consequences will result, hence the necessity of steam traps at certain intervals and especially at low points or where water pockets are unavoidable. These traps remove the water without letting the steam out.

(3) The expansion in 100 ft. of steam pipe when heated through 150° F. is about 2 in. This means that some provision must be made to take care of this expansion in a piping system. Perhaps the best method of taking care of this is by placing long-turn bends and goose necks in the steam lines, but this type of expansion joint requires a lot of room, and is not suitable for tunnel work. All the expansion joints used in this work are of the gland and packing type which allows the ends of the pipes connecting to slide in and out of the joint without leaking steam.

(4) The mechanical details of the piping layout must be such that ample strength is provided in all parts. For this reason the high-pressure lines were made of extra-heavy steel and joints were scarfed and welded by the electric welding process and all fittings and valves guaranteed to stand 250 lbs. per square inch.

There are two main steam headers in the boiler room and the boilers are so connected that either header may be used. Between each boiler and header are two valves,

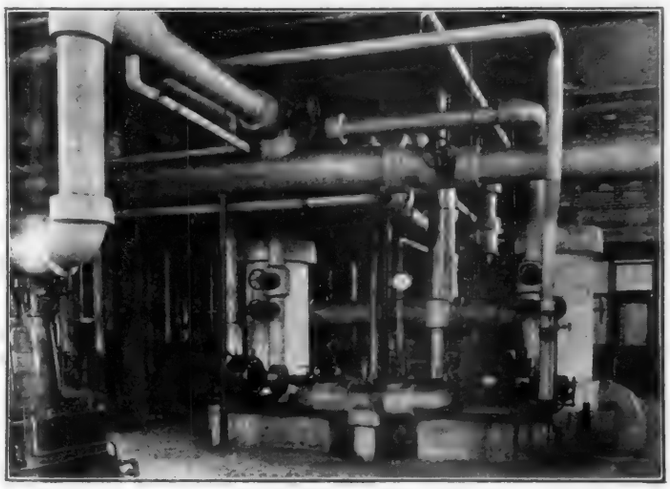


Fig. 3—Generators and Centrifugal Pumps for circulating hot water to the Hospital.

one a stop valve and the other a non-return stop and check valve. This latter is so constructed that if a break occurs in the line it will automatically shut the steam from the line and let the safety valve take off the steam generated in the boiler. In the engine room there are two main 12-in. headers, one high pressure and one low. All the steam engines, turbines and pumps take live steam from the 12-in. high-pressure main and they all exhaust into the 12-in. exhaust main. The exhaust main is connected to the feed-water heater and a portion of the exhaust goes to heat the feed water for the boilers, while the remainder goes to the heating system.

There are two steam pipes extending from the power house through the tunnel to Fleming Hall, a distance of about 1,300 ft. The high-pressure pipe is 5 in. in diameter and is capable of carrying 150 lbs. per square inch. The low-pressure pipe is 7 in. in diameter and the usual pressure carried is 10 lbs. per square inch. This pressure may be increased if necessary. Both these pipes are connected through pressure-reducing valves to a 12-in. header in Fleming Hall, from which the steam is distributed to most of the college buildings.

A 3-in. high-pressure steam line goes to the hospital to supply the steam heated Empire wing, and the sterilizer which uses steam at 60 lbs. pressure. A 4-in. return pipe extends from Fleming Hall to the power house and to this is connected the return pipe from the hospital.

WATER PIPING AND PIPE COVERING

The hot water line leading to the hospital and return is a 6-in. extra heavy pipe with welded joints where possible, while Van Stone joints were used to make any other connections required. The whole piping contract was carried out by Garth and Company, of Montreal.

All high-pressure pipes in the boiler room, engine room and laboratory are covered with 85% magnesia sectional covering 2½-in. thick, and all valves and fittings are covered with a plastic covering of the same material. The covering on the low-pressure pipes is of 85% magnesia, but only 2 in. thick. All other heat-radiating surfaces, such as water heaters, are covered with a 2-in. layer of plastic insulating material.

TUNNELS

The construction of a central heating plant to accommodate both the university and the hospital, occasioned the building of about 1,800 ft. of conduit for the pipes required in distribution. The old heating plant provided a distribution system for the university group of buildings which, with a few exceptions, was utilized in the new plant. The construction of these conduits involved the crossing of two city streets, with their gas and water mains, the crossing of one of the largest of the city's trunk sewers, and several branch sewers.

As the mean water level of lake Ontario is about 245, and King street, the first city street crossed, is only 250, a conduit of the section shown would be below water level, and the lower end would be without natural drainage. It was therefore necessary to make this part reasonably waterproof and, in addition, to provide a sump and pump for any seapage that might obtain. No perfection of waterproofing was considered warranted, as the pump would be a necessary part of any economical construction.

The conduit grades fell continuously from all buildings to the power house site, on the waterfront, and it was decided to use a concrete tunnel in its construction.

From end to end no sewer connection was arranged from the inside of the tunnel, but weeping tiles were laid on the outside, at tunnel grade, from the upper end to a point beyond which no sewer connection was possible. No wash or plastering was asked for, but special attention was directed to thorough spading and compacting of the concrete, and definite methods of construction work joints were prescribed. The design was justified by the results secured. No objectionable leakage obtains and the small electrically-driven power pump described in a previous paragraph, handles all the water in a maximum of thirty minutes operation in twenty-four hours.

All tunnels, both mains and branches, were originally designed with a height of 5 ft. 9 in., but the branches were afterwards changed to the dimensions shown in Fig. 2. This revision was made through lack of head room in crossing one of the city's main sewers.

Aerology for Amateurs and Others

The Evolution of Modern Ventilation and its Effect on Present and Future Practice

BY E. VERNON HILL

Previous articles in this series are as follows: January, 1923, Historical Sketch; February, 1923, Health and Comfort Factors; March, 1923, The Manufacture and Use of Thermometers; April, 1923, Test Methods; May, 1923, Air Dust; September, 1923, Classification of Test Methods for Dust Determinations; October, 1923, Discussion of Test Methods for Dust Determinations; November, 1923, Odors.

IX—CO_2

IT IS a well-known fact that the present design of our mechanical ventilation systems depends to a very great extent on the ancient belief that CO_2 was the important toxic substance in expired air.

The standards of ventilation based on the CO_2 content set by Pettenkofer seventy-five years ago still determine to a large extent the design and capacity of our ventilating equipments at the present time. It was a convenient hypothesis. Air purity was readily tested and the deficiencies (of air volume) easily detected.

Fortunately, or unfortunately, as the case may be, testing air conditions is not as simple a procedure as we at one time supposed. Pettenkofer, in his later writings, pointed out that CO_2 was not the harmful constituent in respired air, although he continued to recommend the use of the CO_2 content as an index to other supposedly harmful substances of which it was a convenient measure.

The work of Hill, Flügge and others during the present century not only showed clearly that CO_2 was not harmful in the concentrations met with in ventilation practice, but also that there was little reason to believe that normal individuals expired substances of any kind that were particularly injurious. The CO_2 test, therefore, fell rapidly into disrepute as a measure of ventilation.

However, in this instance, as in many others we have pointed out from time to time, the pendulum swings from one extreme to another. While CO_2 alone is not a safe measure of good ventilation, neither should it be discarded, as it is a very convenient method of determining the air supply to an occupied room, particularly rooms ventilated by windows or other so-called "natural" methods.

CARBON DIOXIDE EXHALED BY HUMANS

Physiologists have determined with considerable accuracy the amount of CO_2 given off by males and females, adults and children at different ages, while at rest, during light work, during severe exertion, etc. The following table compiled from various authorities gives a fair average of CO_2 exhaled in cubic feet per hour.

CO_2 EXHALED IN CUBIC FEET PER HOUR BY HUMANS

	At Rest	Light Occupation	Severe Exertion
Man	0.7	1.3	2.5
Woman	.5	1.2	2.3
Youth, Male	.6	1.0	2.0
Youth, Female	.4	.7	2.2
Child, 6 to 10	.4	.7	
Infant	.3		

In determining the air supply in a theatre by the CO_2 method, we use 0.6 per cubic foot per occupant per hour as the average of the amount of CO_2 exhaled. This is due to the fact that the audience is mixed, containing a relatively large proportion of adults, about equally divided between males and females and with a certain proportion of children.

In schools, we use 0.5 cu. ft. for high schools and grammar grades and 0.4 cu. ft. for the grades below this. Using also four parts of CO_2 per 10,000 in the outside air, we can from these data, and knowing the average CO_2 content of the air in an occupied room from analysis, determine the amount of outside air entering. The formula is as follows:

$$X = \frac{0.6 \times 10{,}000}{a - n}$$

in which

X = cubic feet of outside air supplied per hour.
a = average analysis of CO_2 in a room in parts per 10,000.
n = CO_2 content of the outside air, also in parts per 10,000.

Example:

Q. The average CO_2 content from five air samples taken in a moving picture theatre was 10 parts per 10,000.
How much outside air is being supplied to this theatre?

A. Substituting "10" for "a" in the formula and "4" for "n," we have

$$X = \frac{6{,}000}{6}$$

or

X = 1,000 cu. ft. of air per hour per occupant being introduced.

The determination of the CO_2 content at different places in an occupied room is also of great value in determining the distribution of the air supplied, as the greater the outside air supply, the lower will be the CO_2 content. Locations, or pockets, showing high CO_2 necessarily indicate a deficient supply of outside air at this point.

The variations of CO_2 content at different points from the average CO_2 content of the room as a whole may also be used in arriving at a percentage of perfect distribution. This is the method employed in plotting results on the Synthetic Air Chart, which will be described in detail in a subsequent article.

METHODS FOR DETERMINING CARBON DIOXIDE CONTENT

The Peterson-Palmquist apparatus for determining the CO_2 content in the air is the most widely known and perhaps most generally successful method employed. The principle involved is the reduction in volume of a sample of air measured under the same conditions of temperature and pressure before and after the CO_2 has been removed. A drawing of the apparatus is shown in Fig. 29. It consists essentially of an air bulb (D), with a calibrated graduated extension tube (E), and a potassium-hydroxide bulb (B) for absorbing the CO_2, all immersed in a water bath to maintain a constant temperature.

The air to be analyzed is introduced through a stop cock (N) by a rubber tube connection at (o). The air is drawn into the bulb by first filling the latter with mercury by raising the mercury cup (F), which allows the mercury to flow up through the graduated tube (E) and into the bulb. The mercury cup is then lowered and as the mercury flows out, air flows in to replace it.

After the bulb filled with air has stood a sufficient length of time for the air to have taken the temperature of the surrounding water, the stop cock (P) is opened and a pressure reading taken on the manometer (A). This stop cock is then closed, (M) opened and by raising the mercury cup, the air is forced over into the absorption bulb (B). It is returned by lowering the cup to bulb (D) and the operation repeated several times until all the CO_2 has been absorbed by the potassium-hydroxide solution.

The air is finally returned to bulb (D), the stop cock

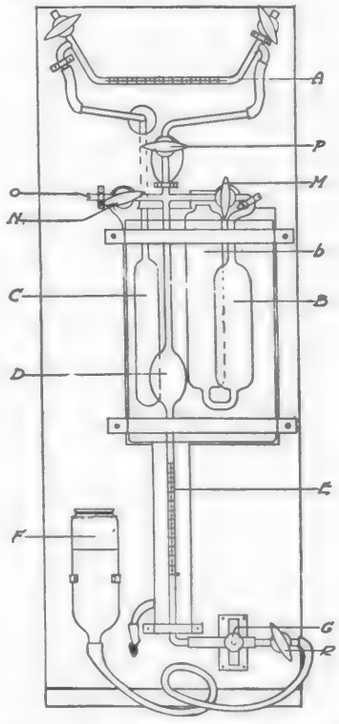


Fig. 29—Peterson-Palmquist CO_2 Testing Apparatus

(P) opened and by manipulating the pressure cock (G), the top of the mercury column is raised on the graduated scale (E) until the manometer bubble at (A) is in its original position. We now have the sample of air in the bulb (D) under the same temperature and pressure as it was before the CO_2 was removed. The decrease in volume is indicated by the height of the mercury column on the scale and this reads directly in parts of CO_2 per 10,000 parts of air. Fig. 30 illustrates the chemist making an analysis.

The Peterson-Palmquist apparatus is accurate to within ½ part per 10,000 parts of air, if operated by an experienced chemist. It is fairly rapid and convenient. The device, however, is not readily portable and necessitates the collection of samples in the field and their transportation to the laboratory for analysis.

THE COTOMETER

To overcome these objections, the writer devised an instrument known as the Cotometer, which weighs only a few ounces. All the essential parts can be carried in

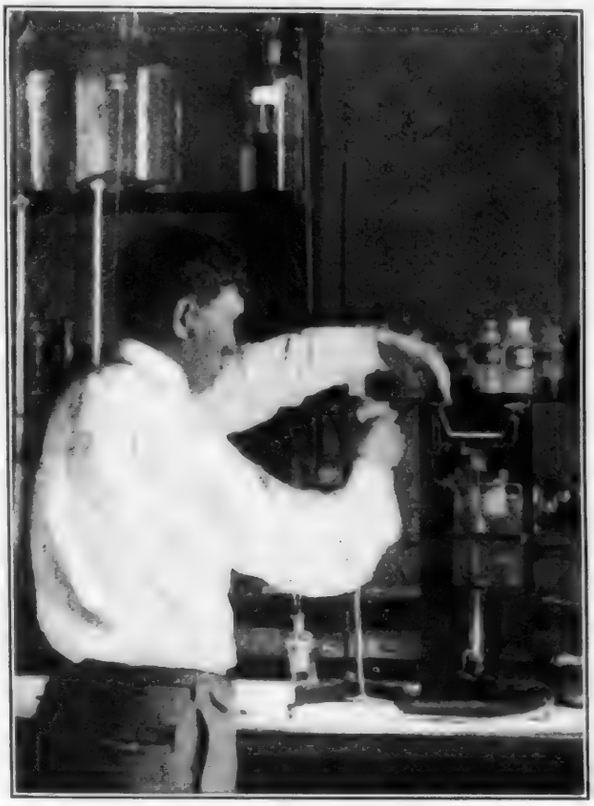


Fig. 30—Making an Air Analysis With the Peterson-Palmquist Apparatus

the coat pocket if necessary. The accuracy in determination has not been sacrificed. The underlying principle on which it operates is as follows:

When a measured quantity of air is shaken up with a solution of barium hydroxide $Ba(OH)_2$ the carbon dioxide in the air reacts with the barium hydroxide to form an insoluble precipitate of barium carbonate $BaCO_3$. The reaction is as follows:

$$Ba(OH)_2 + CO_2 = BaCO_3 + H_2$$

This reaction reduces the amount of barium hydroxide in the solution and reduces its alkalinity in proportion to the amount of barium carbonate formed. If, therefore, the barium hydroxide solution is of a standardized alkalinity, the reduction in alkalinity by the foregoing reaction can be accurately determined by titration with a standard acid solution. The solutions used in the Cotometer for determining the CO_2 content of the air in ventilation practice are:

Barium hydroxide—$Ba(OH)_2$—one-twentieth normal N/20.

Hydrochloric acid—HCL—one-twentieth normal—N/20.

Phenolphthalein is used as an indicator.

The apparatus consists of the following:

2 air sampling bulbs.
1 125 c. c. bottle N/20 HCL.
1 125 c. c. bottle N/20 $Ba(OH)_2$.
1 20 c. c. bottle phenolphthalein.
2 Hypodermic glass syringe droppers, one for each bulb.
4 Calibrated needles for droppers, two for each dropper.
One rubber air sampling pump.

TAKING THE AIR SAMPLE

In using the apparatus proceed as follows: Select one of the air sampling bulbs. See that it is clean and dry. Remove the stopper and insert the end of the tubing of the air sampling pump, closing the tube and the opening to the bulb with the thumb (Fig. 31). Hold

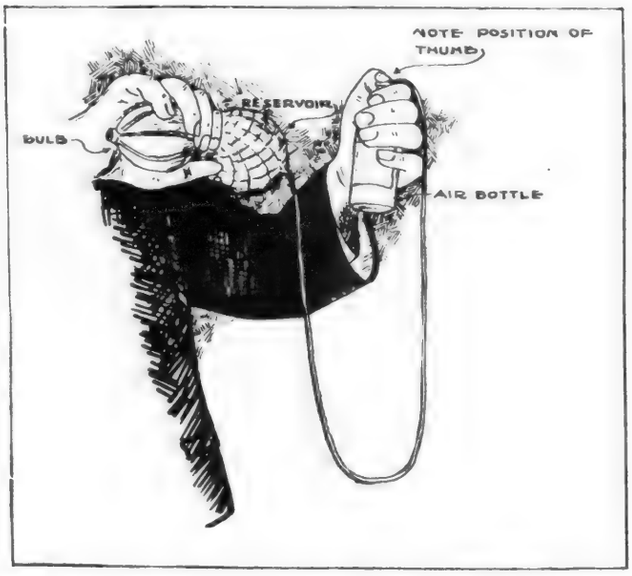


Fig. 31—Taking Air Samples With the Cotometer, Designed by Doctor Hill

the bulb of the air sampling pump in the location from which the air sample is to be taken. Fill the reservoir of the pump by operating the pump bulb and allow air to enter the glass bulb by releasing the pressure with the thumb. Repeat this operation three times so that all the residual air in the bulb and in the pump has been replaced by the air being sampled. Remove the tube and close the bulb with the rubber stopper.

ANALYZING THE SAMPLE

Fill the dropper marked "B" half full with the barium hydroxide solution by inserting the end of the dropper and slowly withdrawing the plunger. Next invert the dropper and affix needle to nozzle by a firm twisting motion. Press the plunger into the dropper still in the upright position until all the air is expelled from the needle. Next remove the stopper from the sampling bulb and insert the dropper, care being exercised not to move the plunger during the operation. Hold the bulb in a good light and drop twenty drops of the solution into the extension tube of the bulb (Fig. 32). This is done by turning the plunger of the dropper, rather than by pushing it directly down. A little practice enables one to perform this operation without difficulty. Next remove the dropper and place one drop of phenolphthalein in the bulb. This gives the solution a bright red color.

The bulb is now turned to a horizontal position allowing contents to flow from tube into bulb and rotated for two minutes, viz., until the CO_2 in the air has had time to react with the $Ba(OH)_2$ solution. Next fill the other syringe dropper (A) with the hydrochloric acid solution in the same manner in which the barium hydroxide syringe was filled. Insert this in the bulb and introduce drop by drop the acid solution, shaking the contents gently from time to time to mix the acid thoroughly with the solution in the bulb.

If there was no carbon dioxide in the air being analyzed, twenty drops of HCL would be required to neutralize the twenty drops of barium hydroxide and dissipate the red color, but as there *is* CO_2 in the air sample, it will react with the barium hydroxide, reducing its alkalinity in proportion to the amount of carbon dioxide in the sample. The number of drops of HCL required to dissipate the red color will, therefore, always be less than the number of drops of barium hydroxide used. The difference in these two will determine the amount of carbon dioxide in the air, using the following formula:

$$P = \frac{6110\ N}{xy}$$

in which

P = the CO_2 in the sample in parts per 10,000.
N = the difference in number of drops of $Ba(OH)_2$, minus number of drops of HCL.
x = the capacity of the bulb in c. c.
y = the number of drops per c. c. for the dropper used.

The capacity of the bulbs is marked on the extension tube of each. Assuming that the bulb has a capacity of 130 c. c. and that the capacity of the dropper is 150 drops

Fig. 32—Analyzing Air Samples With the Air Cotometer

per c. c. we can substitute these values for x and y in the formula, which then becomes:

$$P = \frac{6110\ N}{130 \times 150} = 0.3\ N$$

Therefore, the difference in the number of drops of barium hydroxide and HCL used x 0.30 will give the number of parts of CO_2 in 10,000 parts of air using the 130 c. c. bulb and the 150 c. c. dropper.

PRECAUTIONS TO BE OBSERVED

1. See that the bottles of barium hydroxide, hydrochloric acid and phenolphthalein are always carefully stoppered. If the barium hydroxide bottle is exposed to the air, it will absorb carbon dioxide and be correspondingly reduced in strength. Even with proper precautions, a gradual reduction in strength will occur and in using the apparatus the operator should occasionally titrate a sample of the barium hydroxide with the acid solution to determine the relative strength of each. As the strength of the barium hydroxide solution is decreased by the time it will require 19, 18, 17, etc., drops of the HCL to neutralize, the operator should, therefore, use these new values in making analyses, using, of course, the original twenty drops, but in arriving at the difference in the number of drops used of HCL, he should use the actual value of the barium hydroxide determined by test.

2. Clean the needles and droppers by rinsing with clean water after use and place the fine wire inserts in each needle when they are not in use. Always use the same needles and droppers for the barium hydroxide and the same needles for the acid solution.

3. Consecutive samples may be taken and analyzed in the bulbs without washing and drying, provided they are emptied of their contents after neutralization has occurred. If an excess of the acid or of the barium hydroxide has been introduced they should be washed and dried.

4. In performing the various operations in the taking and analyzing of samples do not leave the glass bulb unstoppered at any time. When changing from the pump to the barium hydroxide dropper, when introducing the phenolphthalein indicator and the acid dropper, place the thumb over the outlet so that the air is not allowed to escape or room air to gain ingress.

5. The fifth precaution is a repetition of the first for emphasis. Keep all bottles stoppered at all times and all apparatus clean.

(*To be Continued*)

Tests of Carbon Monoxide Hazards from Tobacco Smoke Give Negative Results

(*From a paper by G. W. Jones, W. P. Yant, and L. B. Berger, all of the Pittsburgh Experiment Station of the Bureau of Mines.*)

Tests were made with cigar, cigarette, stogie, (Pittsburgh make), and pipe tobacco smoke. Three or more subjects remained in a closed non-ventilated room of 1000-cu. ft. capacity, in which tobacco smoke was liberated by smoking during the entire test of 1-½ to 2 hours duration. Samples of the room atmosphere were taken at intervals during the test and analyzed for carbon monoxide, carbon dioxide, and oxygen. Blood samples from each subject were taken at the end of each test, and analyzed for percentage saturation of carbon monoxide. The summarized results of the tests are given in the accompanying table.

A better criterion for judging the hazards of carbon monoxide in tests of this kind is the percentage saturation of carbon monoxide in the blood of the subjects, since the percentage saturation determines the extent of poisoning from this gas. In no case was the saturation greater than 5%.

SUMMARIZED RESULTS OF TOBACCO SMOKE TESTS
(Tests made in non-ventilated closed room of approximately 1000-cu. ft. capacity.)

Test No.	Kind of smoke	Time elapsed from beginning of test, minutes	Composition of atmosphere in room, per cent by volume			Subjects	CO saturation at end of test. %	Remarks
			CO	CO_2	O_2			
1	Cigar smoke; 12 good grade cigars consumed during test. (45.7 gms.)	30	0.00	0.22	20.73	A	5	In 15 minutes atmosphere was distinctly hazy and caused eye irritation. In 45 minutes it was necessary to wear goggles.
		60	0.005	0.38	20.54	B	5	
		90	0.01	0.50	20.29	C	5	
2	Pipe tobacco; 27.1 gms. consumed during test	30	0.00	0.18	20.75	B	Negative	Smoke not so dense. Necessary to wear goggles after 60 minutes to prevent eye irritation. Subject C became nauseated in 75 minutes and left chamber.
		60	0.00	0.26	20.65	C	Negative	
		90	0.00	0.43	20.48	D	Negative	
		120	0.00	0.52	20.35			
3	Cigarette smoke; 60 popular brand cigarettes smoked during test. (41.6 gms.)	30	0.00	0.23	20.68	A	3 to 5	Eye irritation in chamber in 10 minutes. 30 minutes smoke very dense. 45 minutes necessary to wear goggles to prevent eye irritation. Observer E did not smoke. B. inhaled the smoke during test.
		60	0.005	0.43	20.47	B	3 to 5	
		90	0.01	0.60	20.27	C	3 to 5	
						E	3 to 5	
4	Stogie smoke; 16 good grade stogies smoked during test. (49.4 gms.)	30	0.005	0.20	20.70	C	5	Smoke irritated eyes and throat in 15 minutes. In 30 minutes eye irritation very noticeable. Goggles worn by two observers after 45 minutes.
		60	0.015	0.36	20.54	B	5	
		90	0.02	0.46	20.40	D	5	

In any of the above tests more smoke was present in the chamber in 15 minutes than would probably ever be tolerated in a room or assembly hall. Carbon content of tobacco: Cigar—37.7%; pipe—37.8%; cigarette—37.4%; stogie—37.2%.

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NO LESS an authority than "Farmer" Dunn, formerly official in charge of the New York Station of the U. S. Weather Bureau, declares that our climate is changing, that our winters are becoming milder and that the middle western sections of the country are more subject to floods than they used to be. Thirty years ago, he says, the track of the heavy winter storms was from the extreme northwest to the Great Lakes and thence eastward, whereas now their origin is more often in the southwest. He attributes this change largely to the vast irrigation projects in that region which have placed no less than 16,000,000 acres of hitherto arid land under water. He predicts that unless a limit is placed upon the present irrigation program we will hear of increasing disasters in the Plains States due to floods caused by excessive rainfall. Those who have rather boasted that the winters are "not what they used to be" will have a chance to say "I told you so." The interesting point, however, to the heating engineer is the fact that if our winters are really moderating, the time-honored "zero to 70" heating specification basis may become subject to modification.

THOSE who looked for a cessation of building activity when the country "caught up" with the shortage of homes will find food for thought in the proposal made at the instance of the Department of Commerce that the plan be adopted, as first proposed during the previous peak of the building boom, to postpone all but necessary building work in order to block the danger of a runaway market in building materials. The striking fact is brought out that the present boom is by no means limited to housing projects but affects practically every type of construction. The vast industrial developments during the World War which caused so much concern to those who wondered how markets could be found in peace times for their enlarged capacities, are now discovered to be inadequate for our present needs and this class of building is keeping pace with the general building movement.

Those in the best position to judge, however, are rapidly coming around to the view that the country has definitely entered upon a commercial era which is destined to dwarf all of its past achievements. This view is based not only upon the larger scale on which business is being conducted in this country, but also on the tapping of business opportunities in those sections of the world, notably South America and the Far East, which are just awakening to the Mechanical Age.

To cite one instance of what is happening at home, a referendum vote in New York State, at the last election, provides for the expenditure of $50,000,000 in new public institutions alone to remove the reproach of the maintenance by the State of "fire traps" for the needy and helpless.

The heating industry has always been in a peculiarly favorable position with regard to its essential importance. Even during the worst period of the War, when other lines of activity were curtailed or stopped altogether, the importance of this industry was always recognized. And during the intervening years, from that time to this, despite gloomy forebodings of what was to come after the first flush of post-war prosperity the industry finds itself riding upon the crest of a wave which shows no likelihood of breaking for a least a year to come.

WITH the January issue we shall inaugurate a new double page feature of THE HEATING AND VENTILATING MAGAZINE, in the shape of "Engineering Progress Illustrated." This picture section will be devoted to examples of the more important work done by heating and ventilating engineers, as well as to the many interesting developments in the field which reflect, in a broad way, the progress of the art. Its appearance is a distinct recognition of the fact that the heating industry has been too modest in its appreciation of its own accomplishments. It has been hiding its light under a bushel. As someone has well said, much of the engineering work of the day is hidden from public view and to that extent is not known to the public. Even those on the inside are not sufficiently familiar with what is going on all around them in the way of mechanical design and equipment. It will be the purpose of "Engineering Progress Illustrated" to bring to the light of day some of the splendid accomplishments in the heating field, as well as to give the readers a general panorama of the progress of the industry.

AMONG other features of THE HEATING AND VENTILATING MAGAZINE during the coming year will be a new series of articles under the general topic of "Back to First Principles," which will be devoted to problems commonly encountered in heating work, the solution of which is not always easy, even to those experienced in this line. The first of these articles will appear in January.

The Conservatory Idea Applied to Group Heating of Buildings

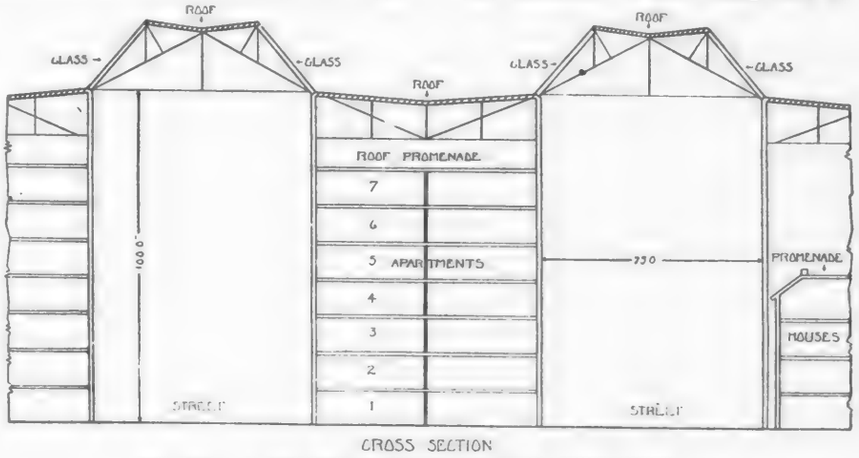
Putting an entire city or suburb under glass, heating it as a giant conservatory having a Palm Beach atmosphere maintained constantly by means of the most improved air conditioning and ventilating equipment, thereby doing away with such annoyances as ashes, radiators, piping, rain on wash days and innumerable other present-day hardships, is the unique idea of Samuel R. Lewis, a past president of the American Society of Heating and Ventilating Engineers and a successful consulting engineer of Chicago. The plan in detail is presented in the *Journal* of the society for November.

Mr. Lewis's scheme is to enclose a given group of buildings with a great permanent highly-insulated well-lighted structure. If the enclosure were lofty no mechanical ventilation would be required, as the difference in temperature between the enclosure and outdoors would cause a rapid air change. Dust, temperature, humidity and even air motion could be controlled by artificial showers of rain, whenever these were needed, from sprayheads in the roof. Ponds of water might be utilized on the roof for their benign value in temperature regulation. Anyone who wished cold air might dress for it and pass outside, but under ordinary circumstances people would wear light clothing and should be free from colds, as they would suffer no extremes of temperature.

A circular structure, quite lofty with heavily-insulated outside walls and windows and open to a great central court is proposed as the most economical construction, in all probability, except for the ground space occupied.

A general idea of the scheme is shown in the accompanying illustrations. They provide for an enclosure approximately one-half mile square, 2625 ft. by 2550 ft. It is intended to be arranged with steel columns 75 ft. on centers, with a chimney at each column to care for the venting of kitchens, toilets, garages and the like. The roof would be about 100 ft. above the ground, and great monitors, 150 ft. on centers, run north and south, having high glass sides, so that the direct sunshine could transverse the entire area at some time every day. The glass would be triple, with cleaning galleries between the sheets, and would be hinged so as to be opened in summer.

This type of construction is considerably more expensive than the ordinary pitched skylights would be, inasmuch as the glass alone would practically cover the area. However, the glass, being nearly vertical, would be less susceptible to hail damage and being hinged can be used in part as vanes to leeward to act as an ejector. There would be glass or doors in the side walls at street ends and above the roof lines to permit summer wind action. Thus north and south winds would sweep through in summer.



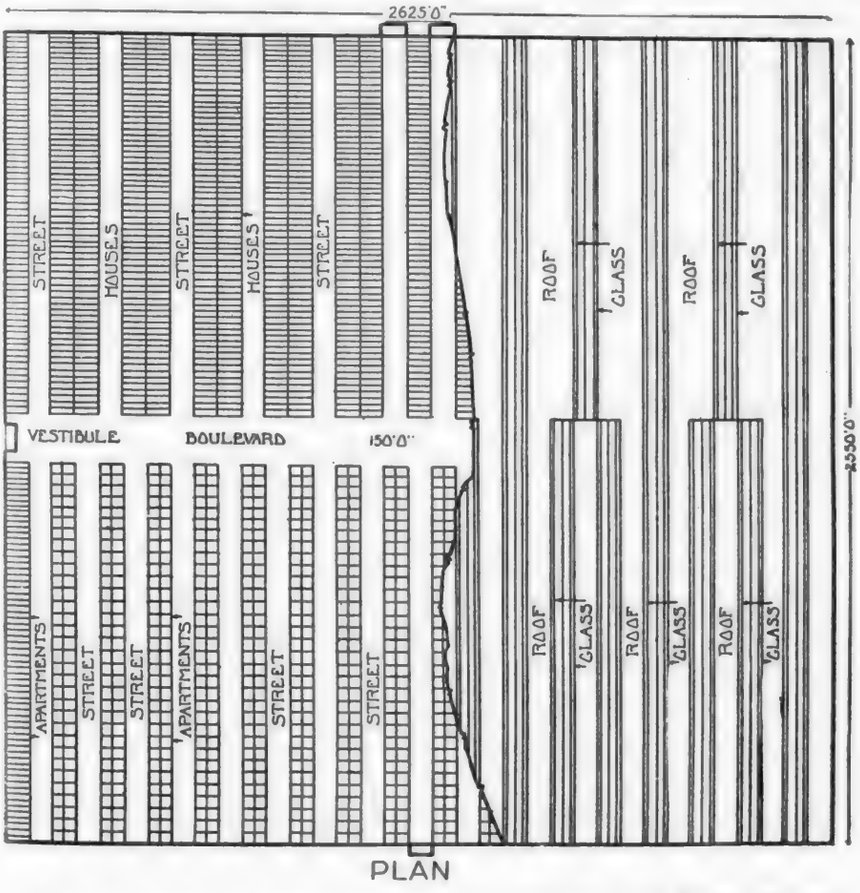
Section of Buildings Enclosed with Glass Roof

BUILDINGS COULD BE LIGHTLY CONSTRUCTED.

Three main streets are suggested, entering through vestibules with tight doors. These streets may be boulevarded, with all sorts of vegetation. The buildings would be the same as conventional houses in tropical climates, mere shells built for privacy and not requiring heavy walls or insulating qualities. They should have watertight roof construction because of the frequent artificial showers which would have to be provided for maintaining the vegetation and for air conditioning. The buildings need not be in straight lines as shown, but could be curved and diversified.

Heating and other services could be supplied by pipes run around anywhere among the roof trusses, and no insulation beyond that for 70° F. would be needed. The 75-ft. centers would make it convenient to place a 75-ft. street every 75 ft. or every 150 ft. and there would be no occasion for spaces for air and light between buildings. In this way the inner roof spaces could be utilized for recreation, parks, etc., and for communication, in addition to that in the streets. Figuring a heat loss of 24 B. T. U. per square foot for the triple-thickness glass roof, with caulked steel sash, 20 B. T. U for the brick walls lined with hollow tile, and 16 B. T. U. for the roof, with gypsum tile or other low cost light weight construction, and allowing an additional 20% of the calculated heat loss for leakage, Mr. Lewis estimates that the proposed enclosure would require 199,000,000 B. T. U., or 796,000 sq. ft. of steam radiation.

The structure with its heating, it is estimated, would cost not to exceed $2.50 per square foot of area, or $16,735,000. In every



Scheme Devised by Samuel R. Lewis for Enclosing City Blocks Under Glass Roof

building panel could be built four six-room homes, each of 1200 sq. ft. At that less than 50% of the area would be used for buildings.

POSSIBILITIES ON AN APARTMENT BASIS.

On the apartment basis it would be possible to get in the total enclosure, seven stories high, 16,128 flats, at four persons each, having a population around 65,000. If the structure were to be used as apartments, the steam heating service would amount to about 50 sq. ft. for each apartment, instead of 250 sq. ft. for the conventional apartment as now built. This would make a total credit of 3,225,600 sq. ft., worth close to $4,500,000. Deducting this from the cost of the enclosing structure would leave a cost of about $750.00 per apartment. There would be saved, at an annual coal consumption of 70 lbs. per square foot of radiation, over 106,000 tons of coal, worth, at $10.00 per ton, $1,066,000. This, it will be noted, is over 8.7% interest on the $12,235,000 cost of the enclosing structure, after taking credit for the radiation saved.

POSSIBILITIES AS A DETACHED RESIDENCE PROPOSITION.

As a detached residence proposition, the heating service per residence would be about 360 sq. ft. (796,000 divided by 2208, which is the estimated number of two or three-story homes that could be built within the enclosure). The average saving in radiation would be around 300 sq. ft. for each of the 2200 buildings, a total of about $1,000,000. Taking credit for this, the sum which would have to be provided by the saving in fuel and the reduced cost of the interior buildings, to get a comparison with conditions outside, is $15,735,000, or about $7,126 per house. The saving in coal, at 70 lbs. per season per square foot, would be 23,100 tons, or $231,000, a 10% interest and sinking fund on $2,310,000 of the $15,735,000 investment, leaving $4,625,000, or around $2,100 which each of the 2200 owners would have to finance for the privilege of living in a conservatory, being free from smoke and dust and having no coal or ashes to handle.

Mr. Lewis makes the point that the air conditioning would be excellent, as the volume of the project is great enough to permit the use of the best apparatus. The mass ventilation provided would also be expected to reduce respiratory diseases.

Finally Mr. Lewis proposes to place storage tanks or cisterns on the roofs or between the trusses for conserving the rain water, and from these controlled rains from the sprayheads would be turned on as required. Air movement within the structure would be effected by the artificial rains. When the cisterns become exhausted water would be pumped to the sprays. A refrigerator is also provided for so that it would be easy and perhaps desirable to cool the water in the cisterns in warm weather. After a shower the cool water could be pumped back to the roof.

"I'll grant," concludes Mr. Lewis, "that it may be a few years before my sixteen million dollar, half-mile square project will be floated, but I predict that the roofing over of streets in metropolitan districts will come quickly. The saving in heat will finance the construction."

New Standards Proposed for Cast-Iron Pipe

New standard specifications covering dimensions and materials of bell and spigot and flanged cast-iron pipe and fittings will be undertaken by the American Engineering Standards Committee, if the recommendation of a sub-committee on this subject is favorably acted upon. This action was taken after the special committee had considered various specifications for cast-iron pipe submitted by the American Gas Association and by the American Society for Testing Materials. It was found that neither of the specifications submitted by these two bodies seemed to satisfy the needs of all interests concerned and it was voted to defer approval of the iron pipe standards already in the field, pending consideration of the subject by a conference fully representative of all having an interest in the subject. The history of the development work on pipe flanges and fittings for high-pressure work, under the sponsorship of the A. S. M. E., the Committee on Manufacturers on Standardization of Fittings and Valves, and the Heating and Piping Contractors' National Association, was also reviewed.

Oil as the Coming Fuel

A significant statement of the prospect of oil becoming the ultimate fuel, made by Henry L. Doherty, president of the Cities Service Company and the Empire Refineries, before the National Petroleum Association, gains added significance from the fact that Mr. Doherty has long been a prominent figure in the gas-burning field.

Oil, he said, could be used to great advantage for domestic purposes instead of coal. In and around New York City, it costs a minimum of $2.50 a week for house furnace attendance, while $5.00 a week is the usual charge, with a heating season, say 30 weeks. This means a cost of $75.00 to $150 00 a year. If ten tons of coal are used the cost of this attendance over and above the cost of coal amounts to from $7.50 to $15.00 a ton, and this is all saved if oil is used. A minimum of 100 gal. of oil to displace a ton of coal would make this oil worth 7½ to 15 cents a gallon over its fuel value. It should never require more than 185 gal. of oil to displace a ton of coal, and on this maximum amount oil would be worth from 4 to 8 cents over and above its fuel value.

The room required for a coal furnace, ash piles, ash cans, and coal stock is considerable. This space can be greatly reduced by the use of oil and often adds the equivalent of one or two rooms to the home. This may be worth as much as $10.00 per month for the full year or a total of $120.00 per year.

Anthracite coal sells in and around New York at $15.00 per ton. The competitive fuel value for oil being 15c per gallon where 100 gal. will displace a ton of coal and 8.1 cents per gallon where 185 gal. are required to displace a ton of coal. Now let's make up some figures on the basis of a home using 10 tons of coal per year with a cost of $15.00 coal, $110.00 a year for furnace attendance, a saving of $50 a year in space and we will consider the average of 100 to 185 gal. of oil per ton or 142½ gal. of oil.

Coal, 10 tons at $15	$150.00
Furnace attendance and removal of ash	110.00
Value of space saved	50.00
	$320.00

$320.00 divided by 142.5 gal. of oil equals 22.4 cents per gallon as the value of oil to the homeowner.

HOUSE HEATING OIL CONSUMPTION INCREASING

An insistent demand has sprung up throughout the country, said Mr. Doherty, for oil for house heating. This demand was not suggested or even stimulated by the oil companies but some of the oil companies due to the force of this insistent demand are now supplying this demand or are making plans to meet it.

In many cities, said Mr. Doherty, where there is no attempt on the part of the gas company to do house heating, here and there we find a customer heating his entire house with gas. The price of gas is generally $1.00 a thousand or more, and its calorific value is generally 506 B. T. U. per cubic foot or less. So by these figures you will see that many people are willing to pay the equivalent of 25 cents a gallon for oil to heat their homes.

New York City's Huge School Building Program

Although New York City has fifty-nine schools and school building additions under construction, the city stands ready to contract for about $105,000,000 in additional projects within the next twelve months. Within the next four weeks, states the *American Contractor,* bids are to be opened for $9,000,000 worth of work, and contracts aggregating from $6,000,000 to $10,000,000 will be let in each month thereafter.

Now in the drafting room, in various stages of completion, are plans for thirty-six projects to provide sittings for 70,000 additional pupils—this despite the fact that school buildings now under way will, of themselves, furnish sittings for 89,000 children.

Within the next five months, a majority of the thirty-six new projects will be under contract, and in the city drafting rooms their places will be taken by designs for still more buildings.

So tremendous is the anticipated program that the authorities in charge, and particularly William H. Gompert, architect of the board of education, fear a shortage of mechanics and materials and a possible failure of transportation. They particularly ask estimates from contractors who have not been accustomed to bid on school work.

Stating that the entire program is of the most urgent and vital necessity, and that it should have precedence over all other construction—with the possible exception of a few of the more imperative housing projects, Mr. Gompert has issued an unusual statement calling for co-operation of all the various factors in the building industry and telling what is required of each if the program is to be carried through. He asks not only that mechanics forego all bonuses, but even that contractors, if necessary, undertake the work at a sacrifice of profit, because it is of such emergency nature.

Legal Decisions

Where Owner Selected Boiler, Contractor's Guaranty of Heating Capacity Held Inapplicable

In an action against a school district for an alleged balance due on a heating and plumbing installation contract, the school district denied liability and made a counterclaim, contending that the plant would not heat the building and had to be replaced by one of larger capacity. The technical specifications embodied by reference in the contract described in detail the heating system and plumbing which were intended to be put in, and contained a guaranty clause that the plant would sufficiently heat the building in cold weather. There was no question that the boiler installed did not do so, and the question was whether, under the circumstances, the contractor was bound by the guaranty.

The Circuit Court of Appeals, Eighth Circuit, holds, Pomerene v. School Dist. No. 1, City of Plattsmouth, Neb., 288 Fed., 145, that, the district board having, under its reserved right, substituted a boiler of its own selection for that on which the plaintiff was asked to bid, the purpose of the guaranty clause, in so far as it related to the heating capacity of the boiler, was put aside and did not become a part of the plaintiff's contract. Judgment for the defendants was therefore reversed and the cause remanded.

Completion of Work in Computation of Time for Filing Mechanis' Lien—Missouri Statute

On July 21, 1915, a contract was entered into for the installation, in three two-story buildings, of six steam heating plants, together with the necessary boilers, radiators, valves, pipes, etc. The work commenced September 23, 1915, and was apparently completed in January, 1916, when it was turned over to the owners as complete and the heat turned on. Afterwards certain rubber diaphragms, without which the boilers would not be complete, were found to be defective, and were put in by the contractor at the request of the owners, without extra charge. Without these diaphragms the boiler could not be used. When they were first put in the contractor did not know they were defective. The last of the new diaphragms was installed on March 25, 1916.

Under these circumstances the heating contractor sought a lien on the building under the Missouri Mechanics' Lien Law. This statute requires the lien to be filed within six months after the indebtedness accrued, that is, after the completion of the work. The only question in the case was whether the lien was filed within six months after the completion of the work. If the plaintiff was entitled to count the work done and material furnished in replacing the defective diaphragms on March 25, 1916, then his lien was filed in time; otherwise not.

The trial court instructed the jury to enter a verdict against the plaintiff, denying his lien. This was reversed by the St. Louis, Mo. Court of Appeals, Brown v. Davis, 249 S. W., 696, for submission to the jury under proper instructions. The court holds that if the jury believed the facts as disclosed by the plaintiff's testimony, they would be justified in concluding that the last item for work and labor furnished was performed on March 25, 1916, and the lien was filed in time. It could not be said as a matter of law that the plaintiff performed the work of putting in the new diaphragms merely for the purpose of extending the time for filing his lien, or that such work was unimportant or that the owners waived the right to have the defective diaphragms replaced by perfect ones. The original diaphragms being indispensable and defective, the court said, the plaintiff could not in January, 1916 have sued for the contract price without installing new diaphragms. The fact that in January the parties thought the work was complete made no difference.

The fact that the property was sold before the completion of the installation of the heating plants did not affect the rights of the plaintiff as a lien claimant under the Missouri statute, even though the work was done and the materials delivered to the property after the subsequent owners acquired title.

Utility Cannot be Compelled to Operate Steam Heating Plant at a Loss.

The Indiana Public Service Commission has authorized the Winona Electric Light & Water Company to discontinue steam heating service in the town of Winona Lake, where is served 30 consumers, the probabilities of securing additional consumers being very slight, and the present heating rates being so high as to be practically prohibitive. The rates were from $1.50 per 1,000 lbs. for the first 20,000 lbs. to $1.25 per 1,000 lbs. for all over 60,000 lbs.

The equipment and appliances of the consumers being useable with practically any and all types of steam-heating furnaces, the consumers will not suffer a complete loss in their investment in equipment on the discontinuance of this central station, but, on the contrary, their equipment will be needed in securing heat from domestic plants.

This decision is in accordance with the now well established principle that a public utility cannot be compelled to operate for the service of the public at a loss, where it is impossible to hold out to it the possibility of earning operating expenses, including depreciation and a fair return upon its property serving the public. In such circumstances the Commission has no choice but to authorize the discontinuance of service in such cases.

Heat Transfer Rate of Cartridge Copper Heaters

In the description of the Cartridge copper heaters, in last month's issue, it was stated that these heaters, which are furnished in depths ranging from 8 in. to 2 in., have a B. T. U. transfer rate per hour per degree per square foot of surface per degree temperature difference between mean steam and incoming air temperatures of from 8.5 – 9.35 to 14.4 – 19.6, the first figure of each series representing those heaters composed of tubes 8 in. long, and the last figures of tubes 2 in. long. The first series represents an air speed of 1000 ft. per minute through the core, and the last series 2400 ft. per minute.

In further elucidation of this point it may be stated that the transfer rate of 8.5 B. T. U. is for 8-in. deep heaters with an air velocity of 1000 ft. per minute, and the transfer rate of 9.35 B. T. U. is for 2-in. deep heaters at 2400 ft. air velocity per minute. The 14.4 B. T. U. figure is for 8-in. deep heaters at 1000 ft. per minute, and the 19.6 B. T. U. figure is for 2-in. heaters at 2400 ft. per minute.

Through interpolation the approximate B. T. U. transfer for depths ranging between 2 in. and 8 in., at air speeds between 1000 and 2400 ft. per minute, can be closely approximated.

Permits Required for Domestic Oil Burning Plants in New York City

Pending the adoption of rules governing the installation of fuel-oil burners for furnaces by the Board of Standards and Appeals, householders who have installed them as a substitute for coal are being served daily with summonses to court by the Fire Department, because of their failure to obtain required permits from the department. The Fire Prevention Bureau has also refused to grant applications for dwellings, because of the fire hazards involved, until an adequately safe system is approved by the Board of Standards and Appeals.

The board has had the matter under consideration for six months, making a careful study of the various systems for private houses and holding public hearings. William E. Walsh, chairman of the board states that the rules were virtually formulated and the board hoped to adopt them at an early date. It is likely that many of the plants already installed will have to be remodeled to conform with these rules.

The rules proposed by the Bureau of Fire Prevention for the regulation of oil burners in private houses, as submitted to the Board of Standards and Appeals, prohibit the use of the gravity feed system, the Assistant Chief pointed out, but he said that whatever rules were finally adopted by the board would necessarily have to be enforced by the Fire Department, whether they went that far or not.

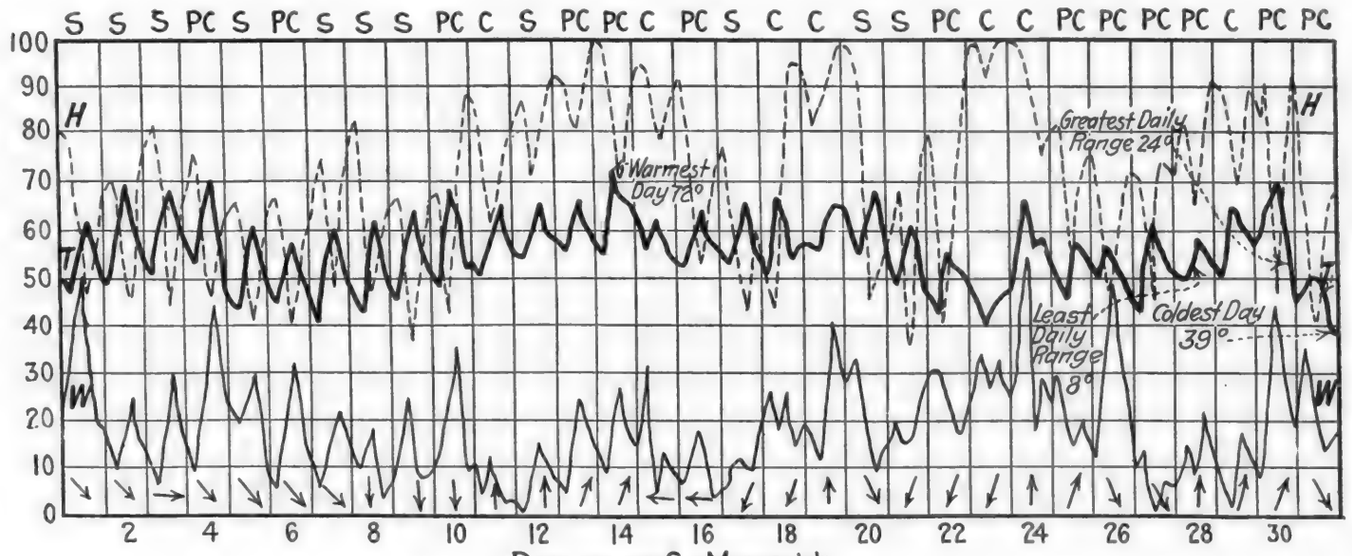
Next Convention of National District Heating Association to Be Held in New York

Announcement is made that the next annual convention of the National District Heating Association will be held in New York City, probably during June, 1924. The association has not met in the metropolis since 1916 when a successful convention was held at the Hotel Martinique.

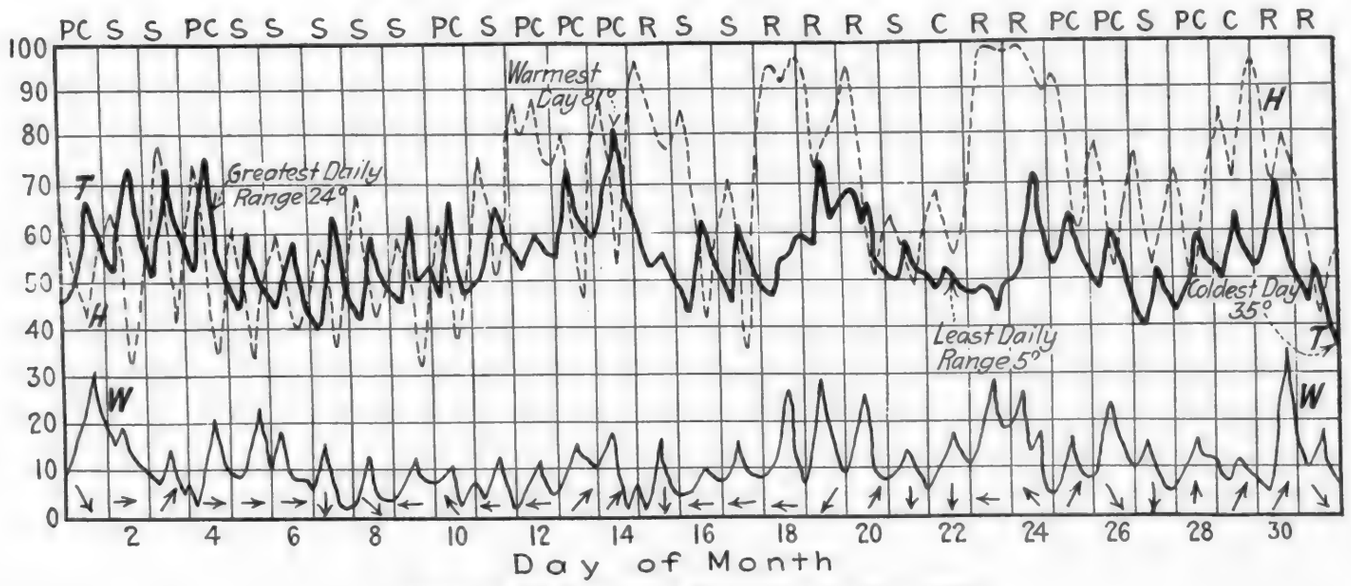
Later advices state that the dates selected are June 10, 11 and 12, 1924.

The Weather For October, 1923

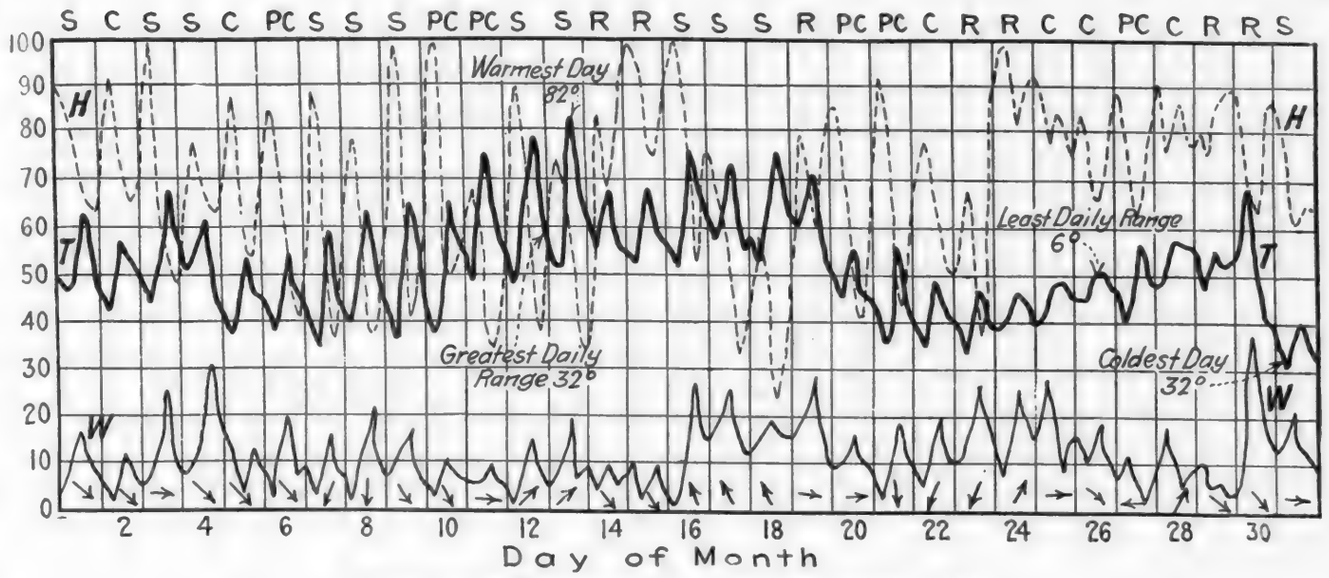
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F	72	81	82	76	79
Date of highest temperature	14	14	13	12	11
Lowest temperature, deg. F	39	35	32	26	29
Date of lowest temperature	31	31	31	31	31
Greatest daily range, deg. F	24	24	32	20	24
Date of greatest daily range	30	4	12	10	8
Least daily range, deg. F	8	5	6	4	5
Date of least daily range	28	22	26	1	26
Mean temperature for month, deg. F	55.6	55.5	52.3	52.5	54.9
Normal mean temp. for month, deg. F	56.3	53.6	55.6	55.1	58.4
Total precipitation, in	4.65	3.37	1.05	4.57	3.74
Total snowfall, in	0	0	0	0.7	0
Normal precipitation for month, in	3.71	3.86	2.36	2.55	2.41
Total wind movement, miles	11,879	7,420	6,880	7,286	7,198
Prevailing wind direction	N W	W	N W	N W	N W
Number of clear days	11	13	9	12	13
Number of partly cloudy days	13	13	9	11	8
Number of cloudy days	7	5	13	8	10
Number of days with precipitation	10	8	7	9	7
Number of days with snow	0	0	0	1	0
Snow on ground at end of month, in	0	0	0	0	0



Record of the Weather in New York for October, 1923



Record of the Weather in Boston for October, 1923


S C S S C PC S S S PC PC S S R R S S S R PC PC C R R C C PC C R R S
Warmest Day 82°
Least Daily Range 6°
Greatest Daily Range 32°
Coldest Day 32°
H
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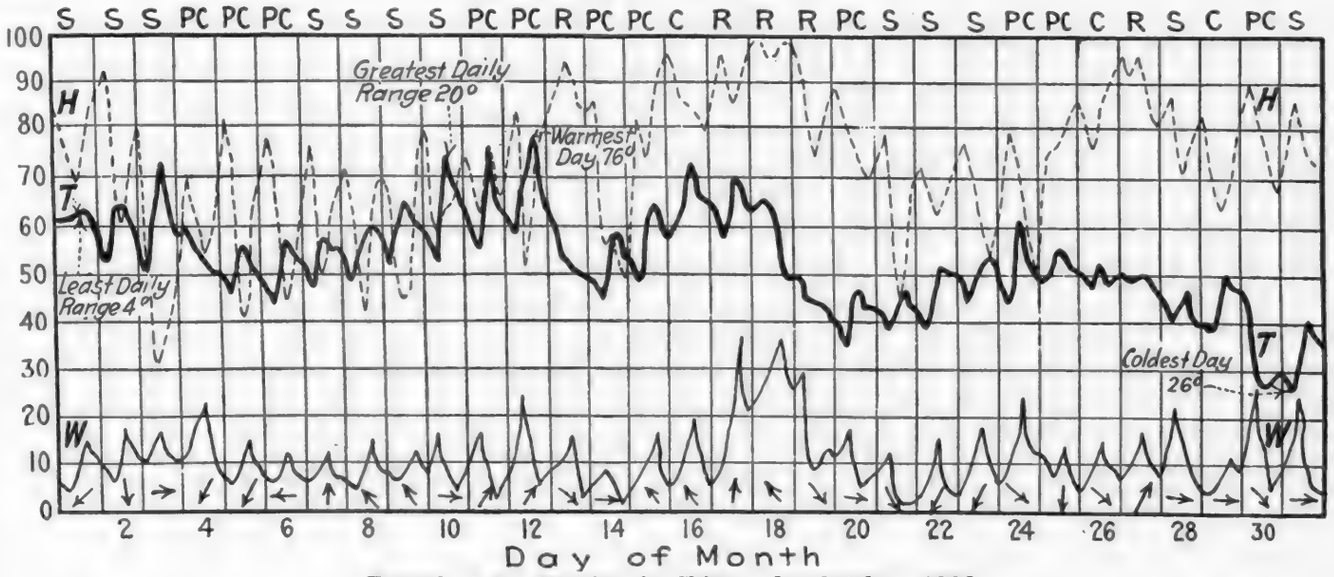
W
Day of Month

Record of the Weather in Pittsburgh for October, 1923


S S S PC PC PC S S S S PC PC R PC PC C R R R PC S S S PC PC C R S C PC S
Greatest Daily Range 20°
Warmest Day 76°
Least Daily Range 4°
Coldest Day 26°
H
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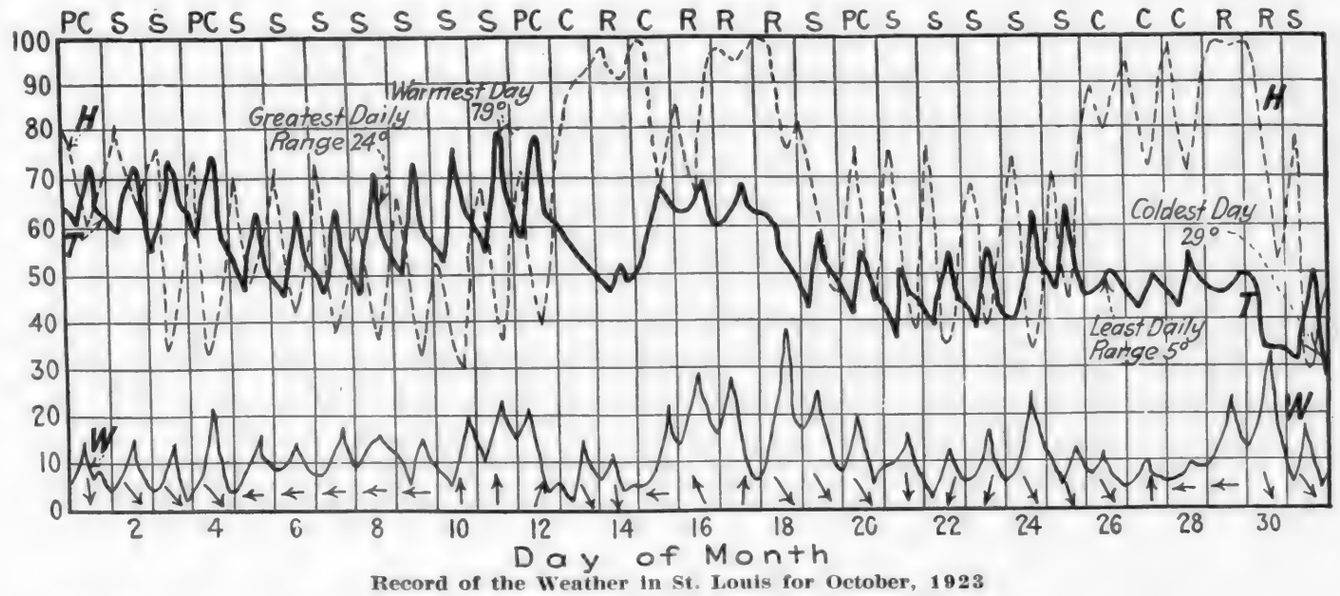
Day of Month

Record of the Weather in Chicago for October, 1293


PC S S PC S S S S S S S PC C R C R R R S PC S S S S S C C C R R S
Warmest Day 79°
Greatest Daily Range 24°
Coldest Day 29°
Least Daily Range 5°
H
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W
Day of Month

Record of the Weather in St. Louis for October, 1923

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A. M., 12 M., and 8 P. M.
S—Clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing directions of wind.

American Society of Heating and Ventilating Engineers

Date Fixed for Annual Meeting

Announcement is made that the annual meeting of the American Society of Heating and Ventilating Engineers will be held in New York, January 22-25. Headquarters will be at the Hotel Pennsylvania.

Kansas City Chapter Hears Talk on Smokeless Combustion

J. F. McIntire, chief engineer for the United States Radiator Corporation, Detroit, Mich., was the principal speaker at the November meeting of the Kansas City Chapter, his subject being "Smokeless Combustion." Mr. McIntire traced in detail the development of bituminous coal-burning cast-iron boilers, showing how this design was originally worked out as an anthracite-burning unit. He discussed at length the method of handling the draft and the combustion gases to obtain the highest efficiency, paying particular emphasis on the importance of good chimney construction. In this connection he asked for support of the chapter in helping the Michigan Chapter advance the practice of requiring smoke tests on chimneys, the purpose being to eliminate faulty construction.

A lively discussion followed Mr. McIntire's address, the talk turning to the subject of oil-burning.

In the absence of President W. A. Gillham, the chair was occupied by Vice-president W. A. Russell. Eight new applications for membership were received in the drive for 100 members by January 1.

"Farmer" Dunn Addresses New York Chapter on the Weather

New York Chapter members learned some interesting things about the weather when they listened to a talk on the subject given by E. B. ("Farmer") Dunn, formerly head of the New York Station of the United States Weather Bureau, at their November meeting, November 19, at the Building Trades Club. Mr. Dunn's talk was illustrated with slides which showed very clearly the structure of storms, as well as their origin and behavior. All general storms in the United States, he said, pass from west to east, the direction of the wind only indicating the general location of the storm center.

He expressed his conviction that the climate in the United States had changed very considerably during the past 30 years. He instanced the fact that in former years most of the storms came into the country from the Northwest while now most of them arise in the Southwest. As a result, he said, we are having milder winters and will continue to do so.

The change in the course of the storms he attributed to the vast irrigation projects in the Southwest. There are, he said, upwards of 16,000,000 acres of land under water which were formerly arid. This may easily account for the change of origin of the storms. It is the cause, in Mr. Dunn's opinion, of the unusually numerous floods in the mid-western States and he predicted that unless some measures were taken to limit the irrigation projects which he characterized as of doubtful value, as far as any further extensions are concerned, the floods in the middle west would become more serious every year.

Chairman Henry P. Kahn, of the Membership Committee, reported the adoption of a novel scheme to secure new members. The committee has prepared a poster extolling the advantages of membership in the society and chapter. At the bottom of the poster are printed several application blanks. The posters are intended to be put up in the offices of manufacturers, architects, and engineers throughout the city. Anyone wishing to use the application can readily tear it off along a dotted line and fill it out. The members are asked to talk it up as they circulate around the city and also wear their society buttons to keep the matter fresh in the minds of prospective members.

Talk on Mining of Asbestos Before Western New York Chapter

A motion picture talk on the mining of asbestos was the feature of the November meeting of the Western New York Chapter, held November 5, at the Hotel Lafayette. Eighty members and guests were in attendance. The speaker was A. C. Gibbons of Johns-Manville, Inc. His talk dealt not only with the mining operations connected with the production of asbestos, but he also gave details of the manufacturing processes, the principal operations being shown in the pictures.

Among the guests present, on special invitation, were 30 members of the evening class of engineering students from the Buffalo Technical High School, accompanied by their instructor, E. H. Sawers. An out-of-town guest was Miss Helen Innis, of the Donnelly Systems Co., New York.

"Certified Heating" as Furnished by St. Louis Contractors

An advertisement in "Radiator," the organ of the St. Louis Chapter, A. S. H. & V. E., calling attention to "certified heating," as furnished by the Heating and Piping Contractors' St. Louis Association, is explained as follows in a recent number of the *Radiator*. As stated in the advertisement, the phrase means the installation of plants reviewed and certified correct by the association's engineer:

"The Heating and Piping Contractors' St. Louis Association realized that a deplorable condition existed in the heating field on account of the various methods or, perhaps, lack of methods employed in designing heating plants to meet given requirements. They resolved to use their influence and funds to investigate and adopt a uniform method of figuring the heat losses of a building, and to require each one of their members to insist on installing an amount of radiation and to provide sufficient boiler capacity to comply with the existing laws and ordinances and to properly meet the demand of the requirements of the owner of the buildings to be heated.

"This resulted in the adoption of the 'Certified Plan,' (based on the A. S. H. & V. E. Guide), making it obligatory for every member to submit a plan for every job coming department of the association. If it was found to be above the minimum standtracted for, to be checked by the engineerards adopted, it should be stamped and so certified, and the association would issue a guarantee to the owner that it would be responsible for the installation fulfilling the requirements of the specifications as certified.

"This assures the owner that he will get what he contracted for and is especially valuable should the contractor die or go out of business between the completion of the contract and expiration of the guarantee."

Illinois Chapter Discusses Gas Heating

H. D. Valentine, of the Peoples Gas Light & Coke Co., Chicago, Ill., was the principal speaker at the November meeting of the Illinois Chapter, at the Engineers' Club, Chicago, November 12. His subject was the use of gas in small house-heating boilers. Stereopticon views were shown of different types of gas-fired boilers equipped with the necessary baffling and the point was made that it is necessary to have the flame "rub" against the heating surfaces as much as possible. President C. D. Allan opened the meeting and the chairman for the evening was Vice-President Homer Linn.

Autumn Meeting of the British Institution of Heating and Ventilating Engineers

The remarkable heating and ventilating equipment of the London County Council building, in London, was the subject of a noteworthy paper presented before the (British) Institution of Heating and Ventilating Engineers, at its autumn meeting, October 9, at Caxton Hall, Westminster, London.

Previous to the presentation of the paper, Edgar Herring, chairman of the institution's Research Committee, reported that, during the last three months, tests on radiator emission had been made, and so far as the testing of freely-exposed radiators under still air conditions was concerned, could be regarded as complete. It had, however, been thought by the committee that before issuing these results, it would prove more valuable if they included tests covering emissions under varying conditions, such as with sleeves fixed over the radiators, with and without side brackets, radiators at different distances from the wall and also with air passing over the surfaces at a known rate.

The work in connection with the testing of thin building materials was well in hand, he said, and with the additional assistance provided by the institution it would proceed vigorously.

Mr. Herring reported that Bulletin No. 1 had been published and could now be ob-

tained. It will be sold to members at 6s 0d. and to non-members at 10s. 6d.

The committee is now employing a whole time assistant, Mr. Rowan, B. Sc.

For the Boiler Rating Committee, Chairman W. W. Nobbs told of the acquisition of a special piece of apparatus for regulating a definite head of water and thus maintaining a constant flow of water passing through the boiler for the purpose of measuring it. The committee now hopes to complete the testing of a whole series of small domestic boilers in time to present the results at the February meeting of the institution.

For the Fan Standardization Committee, G. L. Copping said that little work had been done so far, due largely to the difference of opinion regarding certain definitions, such as static or total water gauges at the fan outlets. There seemed to be a surprising amount of difference of opinion, he said, as to what static really was, not only on the discharge, which was perhaps fairly simple, but on the suction side of the fan.

The committee, he said, as reported in *Domestic Engineering* of London, had considered the American Standardization Code "which had been issued with lightning rapidity." The American committee had been appointed some time after the British committee, and the former's results had all been published. The Institution's committee "were not in agreement with some of the American results and they had decided to use them as references only."

The new president-elect of the Institution is P. M. B. Grenville, joint manager director of Messrs. J. Jeffreys & Co., Ltd., London. He has taken much interest in labor matters and has served on the council of the National Association of Master Heating and Domestic Engineers. In connection with the heating and ventilating contract for the London County Hall, Mr. Grenville acted as chairman of a committee of directors representing the contractors, and was responsible for the design of the mechanical equipment.

Nearly 100 members and guests were in attendance at the meeting.

New Standard Sizes of Baseboard and Floor Registers

Following are the sizes of baseboard and floor registers adopted as "standard sizes" at a recent meeting of register manufacturers in New York:

BASEBOARD REGISTERS

Second Floor Sizes

8 x 10; 8 x 12 and 9 x 12.

Base extension to be not less than 1 in. or more than 1¼ in.

First Floor Sizes

8 x 10 with 2¼-in. base extension for 8-in. pipe.

9 x 12 with 2¼-in. base extension for 9-in. pipe.

10 x 12 with 3¼-in. base extension for 10-in. pipe.

11 x 13 with 5¼-in. base extension for 12-in. pipe.

12 x 14 with 5¼-in. base extension for 12-in. pipe.

Stackheads

6⅛ x 10⅝ in. outside.

6⅛ x 12⅝ in. outside.

7⅛ x 12⅝ in. outside.

9⅛ x 13⅝ in. outside.

9⅛ x 14⅝ in. outside.

No recommendation is made for 14-in. pipe. Height of first and second floor registers to be not less than 2-in. or more than 2¼-in.

FLOOR REGISTERS

8 x 10 for 8-in pipe.

9 x 12 for 9-in. pipe.

10 x 12 for 10-in. pipe.

12 x 14 for 12-in. pipe.

14 x 18 for 14-in. pipe.

16 x 22 for 16-in. pipe.

Changing Over a Warm-Air Furnace Heater from Coal to Gas

A design of a warm-air furnace, intended originally as a coal heater, and now adapted for burning gas, was described by G. I. Vincent, manager of the Syracuse (N. Y.) Lighting Company, at the recent convention of the American Gas Association. It is being installed in a number of homes in Syracuse and will be tried out during the present winter.

The accompanying illustration is intended to be only diagrammatic and represents any form of warm-air furnace from which the grates have been removed and gas burners and checker fire brick installed. The latter is for heat storage only and while this storage is but a nominal amount, it will tend to lengthen the lag.

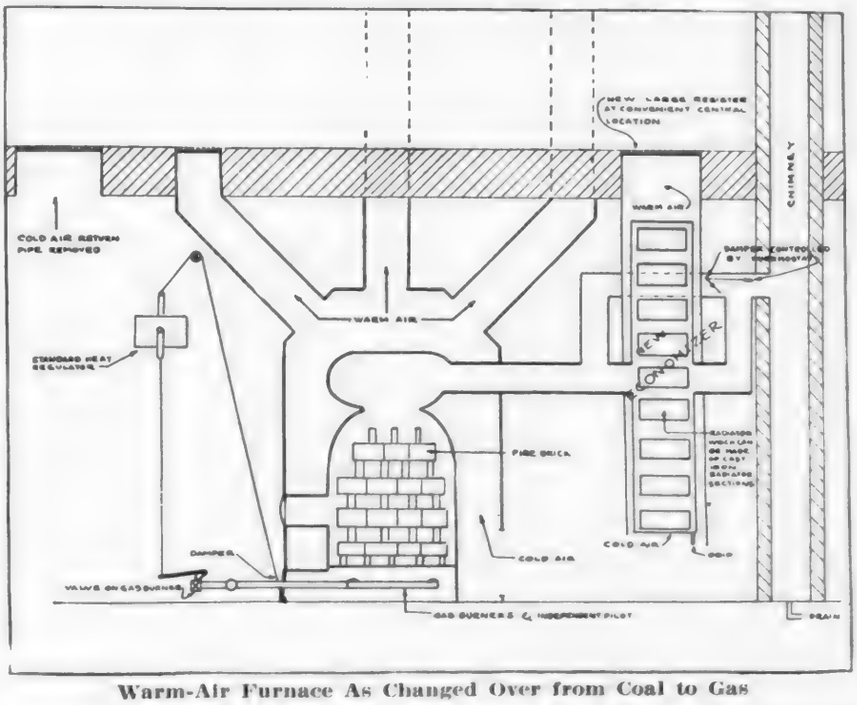
A standard heat regulator, controlled by a thermostat at some point in the house, controls the burners. The design will have two burners off one header, either or both of which will be lighted from the one pilot. The two burners will be used in the coldest weather and one in the intermediate weather. The balanced valve controlled by the heat regulator will supply gas to the header. The large pilot (about 5 ft. an hour) will be supplied independently.

Air admission to the burners will be worked out to keep the excess air down to the safe minimum. The damper shown closes when the burner is shut off to avoid air bypassing to the chimney and cooling the system. Enough air will be admitted independently to supply the pilot.

Between the furnace outlet and the chimney is installed the economizer, which is to be made of such size that it will take all the available heat out of the products of combustion before discharging to the chimney. To definitely assure this result, a damper on the economizer by-pass is controlled by a thermostat in the chimney inlet. By trial, this thermostat will be set at the lowest temperature at which the chimney will remove the products of combustion.

Difficulty, due to condensation, will be reduced to a minimum because the parts subject to condensation effect will be made of cast-iron. The chimney thermostat will be protected in some suitable way. It will probably be necessary to install a drain at the foot of the chimney, as shown.

It is not necessary to have any cold-air return pipes. Those in use can be removed, leaving the opening directly into the basement. Other cold-air inlets opening through the floor at strategic points can be made, if necessary. Both the furnace proper and the economizer will then take cold air directly from the basement and discharge it into the house. How much heat is to be allowed to radiate to the basement will have to be determined by trial. The heating will not be satisfactory if the temperature of the basement is allowed to remain more than 15° F. below the house temperature.



Warm-Air Furnace As Changed Over from Coal to Gas

With the addition of the economizer, the average warm-air furnace, thus converted from coal to gas, will be a better heating system than it was when using coal. The economizer will discharge a quantity of moderately-heated air at some convenient central point while the small pipes on the furnace proper will discharge smaller quantities of higher-heated air through the original registers. If the coal furnace did not properly heat with coal, it might be that it will not heat perfectly with gas but, with the proposed design, we can be assured that it will be better with gas than it was with coal, even if it is not 100% perfect.

The Dust Factor in Factory Ventilation

How Working Conditions and Quality of Product Were Improved in the New Plant of the Phoenix Hosiery Company

BY CHARLES BINDRICH
Chief Engineer

Factory ventilation has been given careful attention, particularly in the last quarter century. The effect of varying conditions of temperature and humidity on the comfort and efficiency of workers has been thoroughly studied. Humidity control for the purpose of improving process efficiency and product quality is well established. The harmful effect of noxious fumes, and heavy process dusts has been the subject of many investigations, leading to better working conditions in all kinds of factories. Little attention has been paid, however, to the dust and dirt normally present in the air of all cities, except in the case of cities like Pittsburgh where the content is abnormally high.

Modern conditions tend to increase the dust content in city and suburban air. Heavy traffic on all streets and roads is a big factor. Greatly increased industrial activity, giving rise not only to soot and dust as a by-product of fuel consumption, but to finely-divided solids from manufacturing processes, is another important source. The fact that this dust and dirt is not always visible is no reason why it is not harmful. Its effect on mechanical and electrical equipment is so definite that special apparatus must be used to eliminate it. Its action on merchandise and factory products causes a large annual spoilage loss. The effect on the comfort and health of workers who are forced to carry on their daily activities in an atmosphere containing dust and dirt is undoubtedly bad.

VENTILATION PROBLEM AT PLANT OF PHOENIX HOSIERY COMPANY

When the Phoenix Hosiery Company began the construction of its new plant over a year ago, every effort was made to make this plant a model of its kind. The ventilation factor was carefully considered, particularly in the light of past experience. The dust and dirt phase of the question assumed particular importance because the new plant was located in a part of the city where there was a great deal of dust and soot in the air. Experience had shown that the comfort, health, and general efficiency of its employees depended to a large extent, on the elimination from their working air of as much of this soot and dust as possible. The dust spoilage item, with regard to the company's product, was also a point of great importance. The ventilation of this new plant, therefore, was a matter to which was given very careful study.

Fig. 1—Method of cleaning Dust Filter Cells, Showing Typical Filter Unit.

After a thorough investigation of the apparatus on the market for ventilation, and the elimination of dust, attention was concentrated on a system which was intended for the one purpose of supplying clean air. This was a filtering device, designed for eliminating dust and dirt.

DESCRIPTION OF TRIAL INSTALLATION

The company decided to make a careful investigation on a trial installation of this device, before proceeding with plans for the new building. Accordingly, a small filter installation was made in front of the air washer already installed in the office building.

As will be noted from the illustration (Fig. 2) this system is based on the utilization of a combined screen and baffle principle for the semi-dry filtration of the air by self-contained equipment without moving parts or sprays. An installation is built up on the unit plan, consisting of cells and frames, assembled in any required number to form a filter of the capacity necessary. Each unit consists of a metal frame and cell, about 20x 20x3¼-in. The cell is filled with hollow cylindrical metal filter bodies about ⅜-in. in diameter and ½-in. long. These filter bodies are coated with a viscous fluid which is non-evaporating and non-flammable.

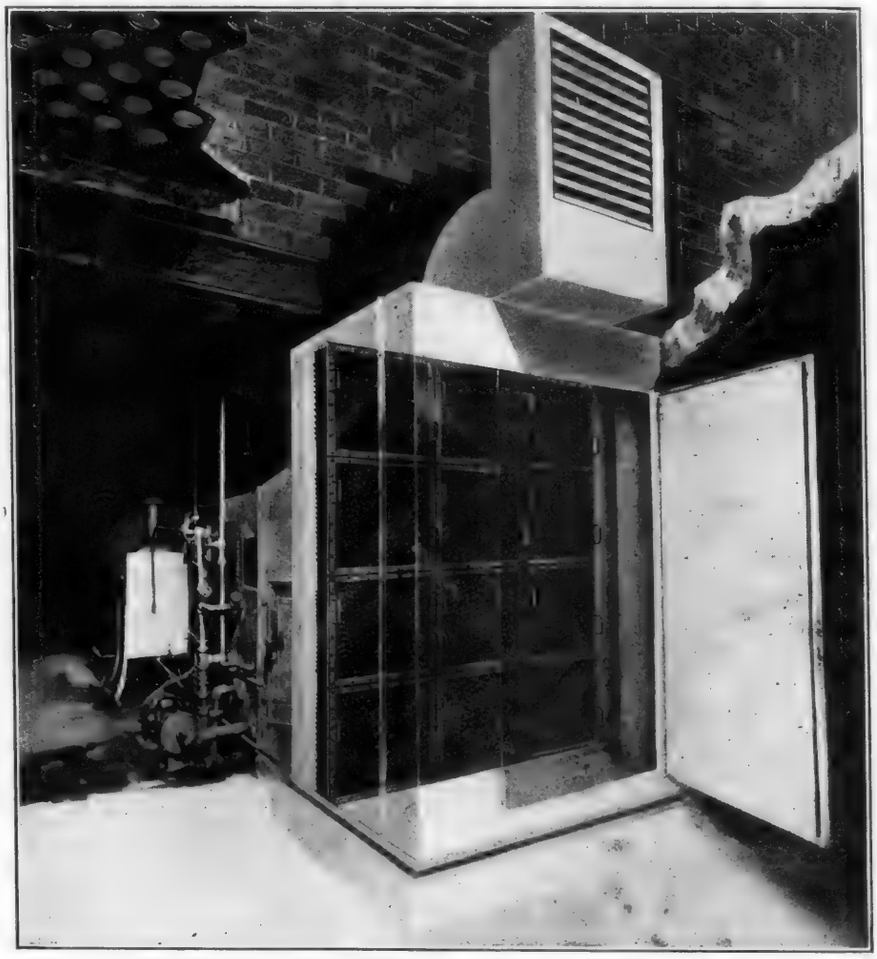


Fig. 2—Experimental Dust Filter Installation at Plant of Phoenix Hosiery Company

The action of the filter is designed to break up the dust-laden air, as it passes through a cell, into innumerable sub-currents, which may wind their way through the interstices formed by the closely-packed filter bodies. The dust and dirt being heavier are driven against the walls of the filter bodies, where they are caught and bound by the viscous fluid which coats the filter bodies. As dust builds up on the surface of these bodies, it acts to gradually add a further surface of fine dust, moistened with the viscous fluid, and this, it is found, acts to catch still more dust.

This action explains the results obtained in tests with the trial filter—increased efficiency after the installation had been in operation for a while. In cleaning the filter it was found unnecessary to remove all the dust, but only enough to keep the resistance at a

constant point and still maintain the required amount of air.

A cell fits into a frame, from which it is readily removed. Fig. 1 shows such a cell with its frame, indicating the handles and lugs with which it is provided. All cells and frames, it should be noted, are made interchangeable. An installation is built up by assembling the required number of frames and cells for the particular installation in question. These should be so installed that no air can pass except through the filters.

TEST OF TRIAL INSTALLATION

The trial installation in the company's office building is shown in Fig. 2. The stated capacity of the twelve cells is 7200 cu. ft. per minute. Tests were made to determine the dust removal due to the filters. These tests were highly satisfactory from the start—practically no dust passing through the filters. As noted above, the efficiency of this installation was found to improve with use, so that ultimately practically all of the dust and dirt were removed from the air. This filter was found especially adaptable for removing soot and carbon particles.

RESISTANCE TESTS WITH CLEAN AND DIRTY CELLS

Resistance tests showed that at first, on the clean installation, there was a resistance of ¼-in. water column. This resistance increased as the cells became dirty, to about ⅜-in. Although the filter was operated for many weeks the resistance was maintained at this point. It might be noted here that subsequent experience over a long period with large installations confirmed the results obtained on this trial installation. Regular cleaning of the cells maintained a resistance of ⅜-in. water column, with the same satisfactory filtering efficiency.

In this connection it should be stated that the cells are quickly and easily cleaned. The instructions of the manufacturers are followed and the cells cleaned in a semi-continuous sequence. When a cell is removed from the system, it is immediately replaced with a fresh, clean, spare cell.

METHOD OF CLEANING CELLS

The dirty cell is cleaned by dipping it in a hot water bath containing washing soda. It is then allowed to drain. When dry, it is dipped into a supply of the viscous fluid in a special tank provided for the purpose, and placed on a rack which forms part of the tank. It then serves as a spare cell to be used when the cleaning of the next cell in the installation takes place. (See Fig. 1).

The company's experience with the large installations has shown that cleaning a cell every 10 days on each installation is sufficient.

Upon completion of the tests on this trial installation, it was decided to adopt the system in the company's new plant.

DESIGN OF FILTERING SYSTEM AS INSTALLED

Ventilation of the boarding room called for a capacity of 90,000 cu. ft. per minute. An installation of 130 cells was required for this room. Fig. 3 shows the filter installation. The steel framework for cells and frames was built up as indicated, with a trough to catch any surplus viscous fluid which might drain from the cells. The entire filter wall is about 18 ft. high and about 23 ft. wide, with the cells arranged as indicated. Access to the upper tiers of the cells is provided by the ladder and gallery as shown.

The filter installation for the mating and boxing room containing 65 cells required for the 45,000 cu. ft. per minute capacity is shown in Fig. 4. The adaptability of this system to space considerations is shown by the different shape of this installation as compared with that in the boarding room. A gallery similar to that used in the former case is provided here.

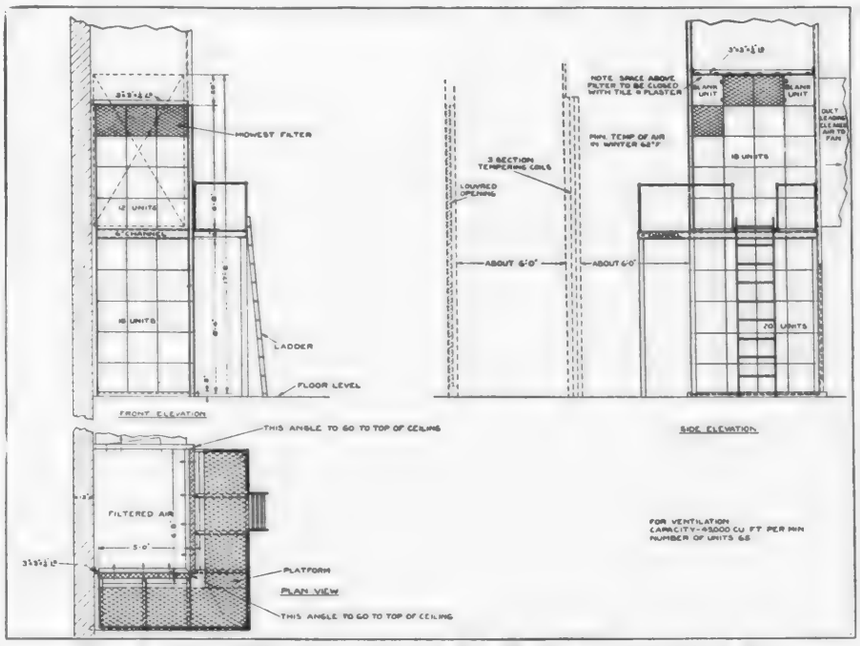


Fig. 4—Dust Filter Installation for Mating and Boxing Room, Phoenix Hosiery Company

In the spinning room, clean air is provided for by a filter installation consisting of 21 cells, with a capacity of 15,000 cu. ft. per minute.

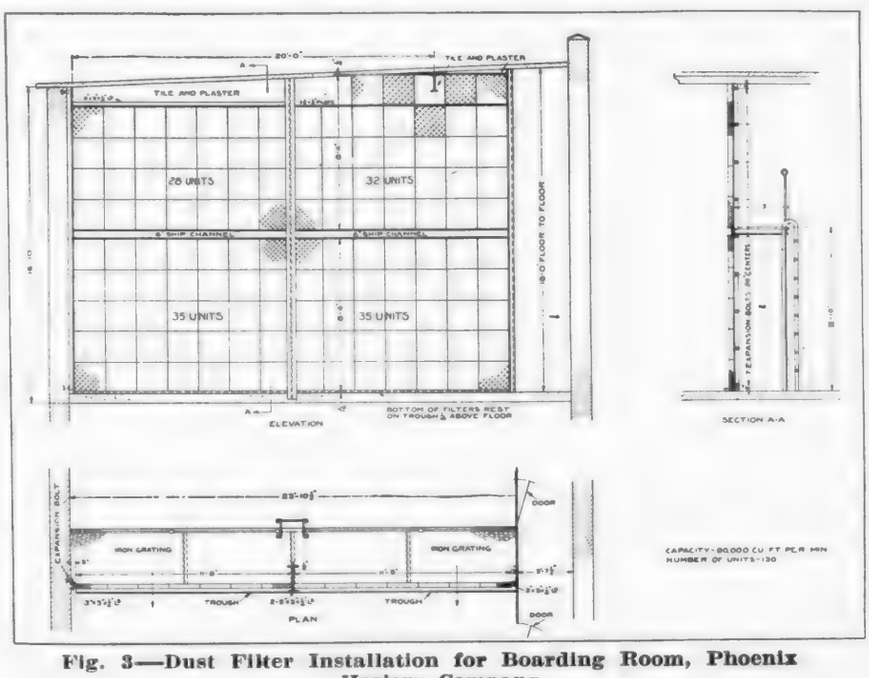


Fig. 3—Dust Filter Installation for Boarding Room, Phoenix Hosiery Company

OPERATING COST

The cost of operation has been found to be low, since there are no moving parts to supervise. One man is required to clean and charge the cells in the four installations, and only a part of his time is chargeable to the filters. The only maintenance chargeable is that due to the small amount of viscous fluid used to recharge the cells.

As noted above, the resistance of the installations has remained at about ⅜-in. water column, with regular cleaning of the cells carried out, as a routine operation.

The results from these installations have been highly satisfactory. Working conditions are infinitely better since no dust can settle on equipment, furniture, and product. The cleanliness of the working air in the rooms described above has also had a noticeable effect on the health and efficiency of the company's employees. The company is able to pack and ship its product in a much cleaner and more attractive condition, with a corresponding benefit to its sales.

Is the Supply of Technically-Trained Men Keeping Up With the Demand?

The need for highly-trained engineering experts for such positions as designers, research engineers, general superintendents and works managers is one which was felt very severely during the war when heating and ventilating men were suddenly confronted with a large number of problems requiring an immediate and effective solution. Since then more attention has been paid to the training of special experts. But the field for trained engineers still remains very large. A recent report of the National Industrial Conference Board dealing with "Engineering and American Industry" shows that during the year 1920 there were employed in administrative positions as supervisors and technical experts 1,510,000 persons. By 1930, it was estimated, 1,900,000 similarly-trained individuals will be required to take care of the ordinary needs of industry. This means that before that date 400,000 men will have to be trained for engineering work, without counting the number required to replace those who will retire from active service.

It appears that, at the present rate of increase, the required number of experts will not be available. Of course, not all of the 400,000 experts will require an engineering education and of the experts presently available, only 300,000 actually appear to have such a training. On the face of it the 50,000 students enrolled to-day in engineering schools every year might take care of the demand. But there is evidence that the present-day actual supply is below the real demand for engineering trained experts. Not all the students taking engineering courses remain finally in the engineering field. So the enrollment should be much larger to secure the nation against a dangerous dearth of well-educated experts. The National Industrial Conference Board lists the following suggestions for possible improvements in the training which men receive from the engineering schools, and regarding a closer co-operation between the engineering schools and American industry:

That the methods of selecting men for admission to the colleges be improved (so as to reduce the number of men dropping out of the profession because they do not find themselves fit for the work they have undertaken).

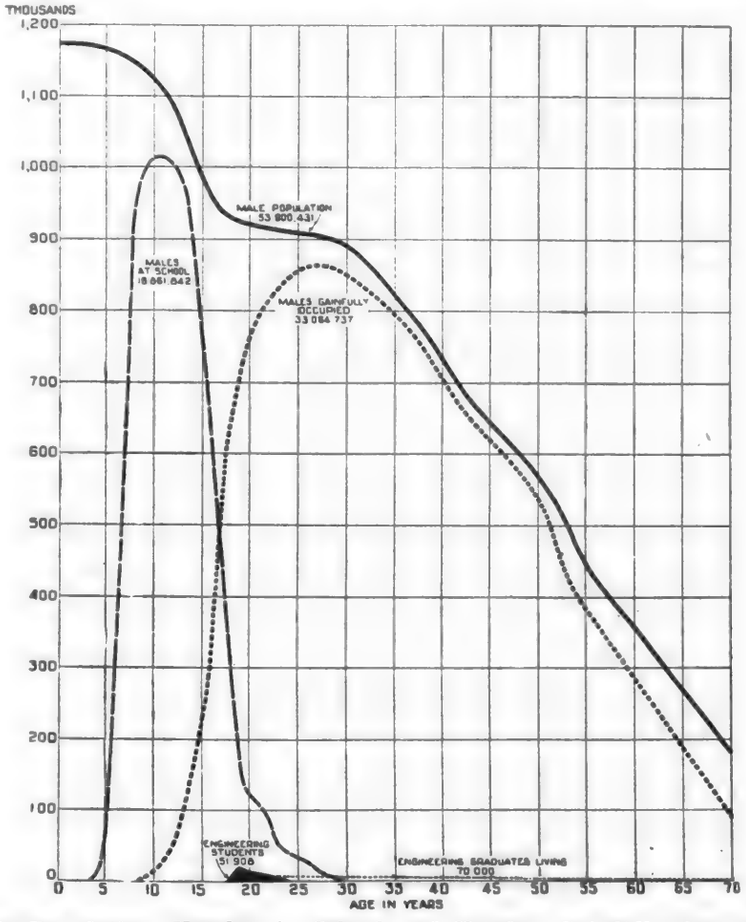
That the students be trained broadly and thoroughly in the fundamentals (so as to widen the applicability of their knowledge).

That the colleges do more to stimulate initiative (so as to foster the inventive sense of the student and encourage originality in thought).

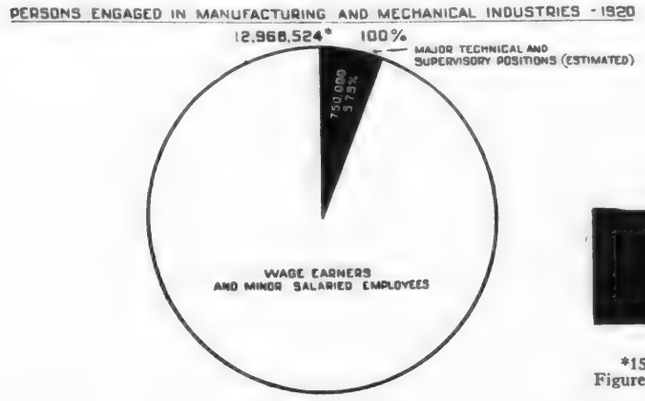
That the instructors in technical subjects have more practical experience and be selected for vision and high ideals.

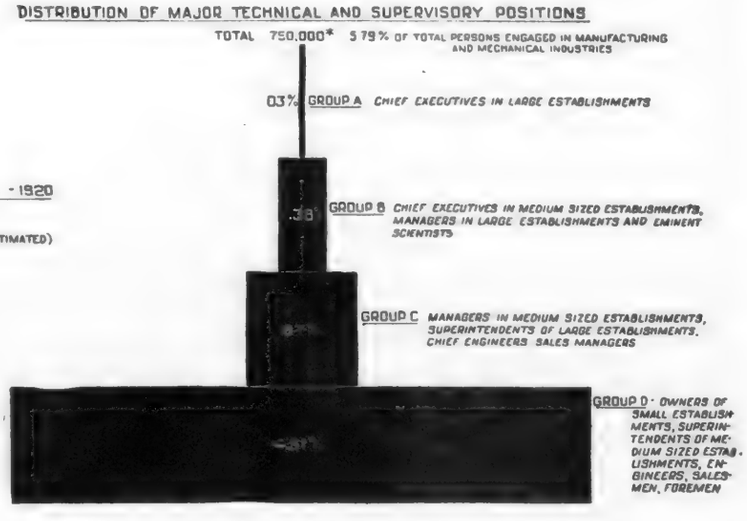
That the students be given practical training in industrial establishments.

Industrialists and others are urged to give young students and others interested in engineering study the opportunity of widening their studies by increasing the existing facilities of practical training during the summer vacation and to give encouragement to employees to undertake extension courses in engineering.



Male Population, Number in School and Number Gainfully Occupied, United States, 1920


PERSONS ENGAGED IN MANUFACTURING AND MECHANICAL INDUSTRIES - 1920
12,968,524* 100%
MAJOR TECHNICAL AND SUPERVISORY POSITIONS (ESTIMATED)
750,000 5.79%
WAGE EARNERS AND MINOR SALARIED EMPLOYEES


DISTRIBUTION OF MAJOR TECHNICAL AND SUPERVISORY POSITIONS
TOTAL 750,000* 5.79% OF TOTAL PERSONS ENGAGED IN MANUFACTURING AND MECHANICAL INDUSTRIES
.03% GROUP A CHIEF EXECUTIVES IN LARGE ESTABLISHMENTS
GROUP B CHIEF EXECUTIVES IN MEDIUM SIZED ESTABLISHMENTS, MANAGERS IN LARGE ESTABLISHMENTS AND EMINENT SCIENTISTS
GROUP C MANAGERS IN MEDIUM SIZED ESTABLISHMENTS, SUPERINTENDENTS OF LARGE ESTABLISHMENTS, CHIEF ENGINEERS SALES MANAGERS
GROUP D - OWNERS OF SMALL ESTABLISHMENTS, SUPERINTENDENTS OF MEDIUM SIZED ESTABLISHMENTS, ENGINEERS, SALESMEN, FOREMEN

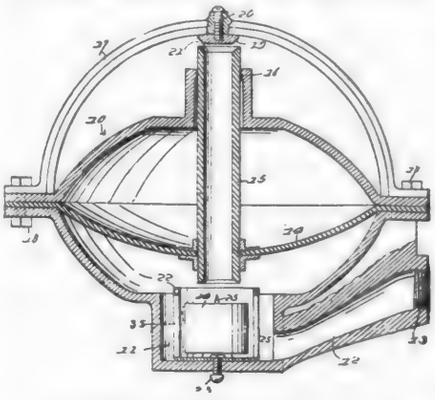
*150,000 engineers, designers and research men are included in Groups B, C and D. Figures are approximated from United States Census of Occupations.

New Apparatus and Appliances

A Valve to Prevent the Formation of A Vacuum

A valve has been designed by Homer E. Curtis, of South Sandisfield, Mass., which is designed to prevent the formation of a vacuum in low-pressure steam heating plants, thus eliminating the trouble due to the siphoning of water from the boiler into the pipes and radiators. It also acts as a large air valve to vent all air out of the steam main.

The valve is intended to be attached to the steam main near the point where

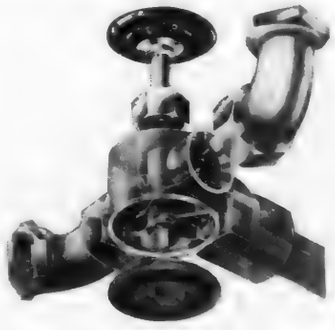


Design of Curtis Valve to Prevent Vacuum

it drops into the return. The connection, however, should always be above the water-line in the boiler. The valve is described as automatic in operation and so sensitive as to close before a steam gauge will show any pressure and open with the slightest pull of vacuum. The first operation, of closing the valve, is accomplished through the condensation of the steam which raises the float until it comes in contact with the lower end of tube 4. Then the parts, 4, 5 and 6, go up together.

A Unique Hot Water Radiator Valve

A valve design for hot water radiators, intended to increase the efficiency of a water heating plant and at the same time to save pipe and labor, has been brought out by the Honeywell Heating Specialities Co., Wabash, Ind., under the name of the Honeywell Unique radiator valve. By their use, it is stated, the water circulates continuously in the risers and through the valve whether the radiator is turned off or on. A by-pass, the full area of the piping, opens in the valve body when the valve is closed. One-sixth of a turn is sufficient to open or close the valve.



Honeywell Unique Hot Water Radiator-Valve

As a result of this construction, it is stated, the radiators heat up almost instantly and no return pipes are required under the radiator. At the same time, constant circulation prevents freezing of riser that are exposed to the cold, making the valves particularly useful for radiators located on upper floors.

Recent Developments in Air-Cleaning Apparatus

The necessity for air free from dust and impurities for the ventilation of electrical machinery, air compressors, etc., as well as its value in numberless manufacturing processes is to-day generally appreciated.

The ever-expanding effects of industry, together with the increasing use of soft coal and rather general contamination of the air by objectionable and injurious gases, have made it clearly evident that outdoor air is not necessarily clean air and have given rise to numerous attempts to provide a practical method of removing these impurities.

A comparatively recent development in this field is the use of air filters made of an indestructible metal filter medium saturated with simple chemicals which are designed to leach out the dirt and dust and deposit them on the filter body. In the case of one filter of this type, known as the Reed unit air filter, as the successive layers of dirt are deposited and bound on the filtering medium additional "adhesine" is supplied by capillary action; being withdrawn from the droplets or reservoirs of the liquid held at the intersections of the media, and in this way binding layer after layer of dirt and keeping the entire system moist for very considerable periods.

Even if the individual fibres of the filter media collect a very thick deposit of dirt, it is stated that the relative space between the fibres will not be appreciably decreased and the resistance will still remain very low.

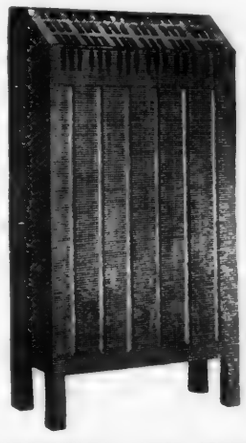
In passing through the filter the air changes in direction from 11 to 18 times. Each change in direction is caused by an impingement of the air on the chemically-coated filtering media and this, of course, serves to increase its efficiency in dust removal.

The filter consists of a light steel frame containing a filtering medium of special metal wire. Both the cell and filtering medium are subjected to a process which is designed to render them proof against deterioration due to rust, acids, chemical fumes, etc. Care has also been taken to make the cell and its filtering media practically indestructible. The filter media are never removed from the cell, the units being supplied with handles which allow them to be easily cleaned as units and recharged with "adhesine" in the tanks supplied for this purpose. When dirty the cells are dipped in the cleaning tank, washed and recharged.

A frame of steel channel-iron is supplied and arranged to receive the filtering unit, each unit and frame forming a complete filtering system in itself but so designed that it can be attached to other units, making it possible to meet varying requirements as to capacity and available space.

A European Design of Unit Ventilator

A so-called laminated unit heater, designed by E. Segesvary, Republikplatz, 13, Bratislava, Chechoslovaka, is shown in the accompanying illustrations. The heating surface in this novel design is composed of copper fins with an approximate thickness of 0.4 mm., arranged with a spacing of 5 m.m.

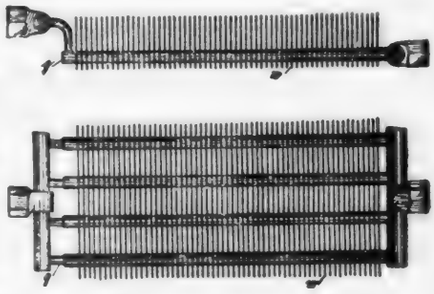


Laminated Unit Heater

The heating element is conducted through the copper tube "b" and this tube transverses the fins at their upper edge. Both the fins and the tubes are "metallic connected."

Cool air enters at the bottom of the unit and flows out through the top of the enclosing cover. This cover, it is stated, greatly increases the unit's capacity by acting as a chimney or duct.

The unit is generally made from 600 to 1000 m.m. high. The laminated unit, with one meter high enclosure, it is figured, will transmit 50% more heat than a cast-iron radiator with an equivalent amount of surface. The copper fins, it is stated, are highly polished and are smooth which prevents any settlement of dust on their sur-



Copper Heating Element in Laminated Unit Heater

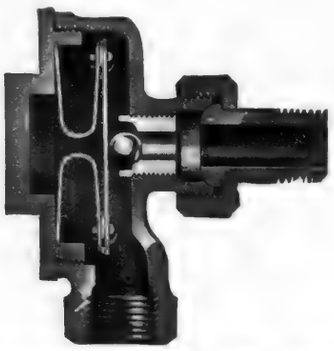
faces. To produce a heating surface of 1 square meter no more than 2.3 kilograms of copper are required.

Mr. Segesvary states that he is interested in arranging for the manufacture of this heater by an American manufacturer.

New Line of Vapor-Vacuum Heating Specialties

A line of vapor-vacuum heating specialties, including a graduated radiator valve and an all-metal radiator trap, is announced by the Ideal Heating Equipment Co., 1250 West 4th Street, Cleveland, O., and described in newly-issued circular matter. The devices are being marketed under the trade name of "Stay-Rite." Among the exclusive features of the Stay-Rite trap is mentioned its ability to overcome corroding difficulties by the use of two non-corrosive metals, brass and nickel, which make up the trap, including the casting, ball seat, thermostatic member and plating. The fact that the thermostat is not submerged or surrounded in water is mentioned as enabling the trap to overcome electralic or galvanic action. When surrounded by boiler water, it is stated, there is likely to be a battery action or plating action by the metals which act as electrodes.

In operation a vacuum has a tendency to open this trap, rather than lock it. This assists in its satisfactory operation over a considerable range of pressure up to 10 lbs. At the same time, it is pointed out, the increase in temperature gives the thermostatic element greater strength to hold against increased pressure.



Construction of New Ideal All-Metal Radiator Trap

Much is made of this point by the manufacturer, a typical example being given to illustrate the point. Presume that an all-metal trap, it is stated, with the thermostatic element on the radiator side is adjusted properly at ½-lb. pressure where it will balance to withhold steam and relieve water. Now suppose the pressure is increased to 5 lbs. First, an increased pressure of 4 lbs. has been added on the valve seat, second, the all-metal thermostat will increase pressure on the valve seat due to the increase in temperature and, third, a vacuum on the return line will exert an additional pressure on the valve seat. Mention is also made of the operating characteristic of the Stay-Rite trap in maintaining the ball valve at the balance point so that it is able to relieve a constant stream of water, instead of an intermittent flow. High-pressure, it is pointed, opens up the trap and allows the steam to blow through freely.

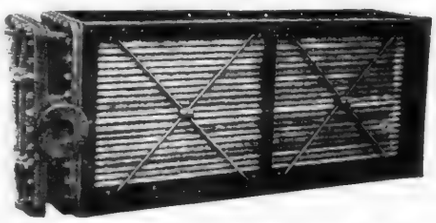
In addition to a loose ball seat, these traps are provided with a nickel and brass thermostat welded together at a high temperature. A three-point bearing against the cover is provided and a disc baffle plate is used to hold the three-loop thermostat in its proper position, to protect the thermostat from direct contact with the water passing through the trap, and to protect or insulate the thermostats from direct contact with high-temperature water, allowing the trap to better free the radiator of condensation.

The trap is furnished in two sizes, ½ in. and ¾ in. with capacities of 200 and 500 sq. ft. of direct radiation, respectively.

The Ideal Heating Equipment Company is incorporated with T. G. Mouat as president. Mr. Mouat, who is a well-known figure in the heating trade, is also president of the Mouat Vapor Heating Company. The other officers are B. B. Preston, Vice-president; and C. J. Deex, treasurer.

New Type of Air Cooler Exhibited at the Power Show

Among the exhibits at the Power Show, in New York, December 3–6, was an interesting type of air cooler shown by the Griscom-Russell Co., New York. It is being marketed under the name of the U-fin air cooler.



U-fin Air Cooler for Use with Electric Generators

The U-fin air cooler, as shown in the accompanying illustration, has been developed during the past year and has met with such success in the central station field that contracts are on hand for coolers aggregating over 500,000 K. W. generator ratings. It is designed for installation under the main station generator and is enclosed in the duct work. Its purpose is to cool the ventilating air discharge from the generator windings.

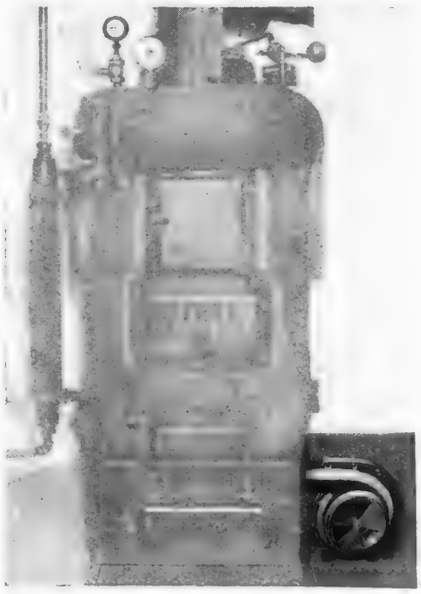
In the past it has been customary to discharge this generator air, which must be forced through the windings to keep them properly cooled, into the generator room and this heat was not only lost but was a source of discomfort to the operating force.

The U-fin cooler utilizes the turbine condensate as the cooling medium and, therefore, the heat which is extracted from the air is saved and the temperature of the turbine condensate on its way to the hot-well, is increased from 8° to 10° F.

This cooler is of the surface type so that the cooling of the air is accomplished in a closed system which permits the use of the same air over and over again. The cooling surface is formed of rigid U-fin tubes of ⅝-in. Admiralty metal, with rectangular or brass fins. Turbine condensate passes through the tubes and the generator ventilating air is forced through the cooler casing and is cooled by its contact with the fins attached to the tubes.

Forced Draft Blower for Domestic Furnaces.

An electric blower for furnishing forced draft under the grate of a boiler or furnace



Domestic Heater Equipped with Forced Draft Blower

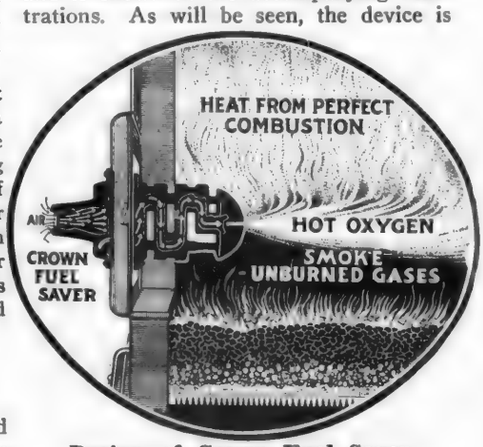
used for house heating has been put on the market by the Coppus Engineering Corporation, Worcester, Mass.

The blower is operated by a 1/12 H. P., 60-cycle, 110-volt, Westinghouse motor. The fan, which is a hard aluminum casting, is mounted directly on the end of the motor shaft, making a compact and simple unit.

With the blower, it has been found possible to burn the cheaper grades of coal, such as buckwheat and screenings, at a saving of $5.00 or $6.00 a ton over the more expensive kinds. By means of an inlet damper the air delivered by the blower can be regulated in quantity and pressure to meet the conditions of the fuel bed and to give satisfactory combustion. An automatic control for steam or water boilers or warm air furnaces can be furnished that will shut off the motor when the temperature or steam pressure reaches a predetermined maximum and will start it again when the temperature or pressure drops. Practically automatic operation is thus possible, with an even temperature and high efficiency.

The Crown Fuel Saver.

An interesting device in the form of a fuel saver has been brought out by the Crown Fuel Saver Co., Richmond, Ind., and is shown in the accompanying illustrations. As will be seen, the device is



Design of Crown Fuel Saver

intended to be attached to the feed door of the heater. In the case of warm-air furnaces, where there is usually a space of from 5 to 10 in. between the feed-door and the fire-pot, the unit is provided with extension collars. Air is drawn through the device by natural draft. As it becomes heated, the air strikes the heated sides and surfaces of the fuel saver and is then diffused out over the fire.

As the company states, quoting from Technical Paper 137 of the Bureau of Mines, at the surface of the fuel bed the gases contain 20% to 30% combustible gas and practically no free oxygen. To obtain complete combustion, therefore, additional air must be introduced over the fuel bed. The question as to why the opening of the slide in the feed-door will not give the desired results is answered by the statement that this will not do because it admits cold air, which acts to chill and check the fire. The Crown saver is especially designed to admit air at high temperature to the combustion space.

With one of these devices attached, it is added, the ash-pit draft and check dampers are operated in a more closed position than would ordinarily be the case. Thus the gas velocity through the combustion track is reduced, resulting in a more uniform and steady heat, as well as in fewer ashes, less smoke and labor, the saving, it is figured, ranging from 20% to 50%. The device, it is stated, will accomplish practically the same results when used with hard coal, soft coal or coke.

In the case of down-draft boilers, the device is attached to the middle doors, between the two grates.

Cast-Iron Sectional Heating Boilers of Extraordinary Size

In presenting a 79-in. series of Ideal smokeless water-tube boilers for soft coal, the American Radiator Company, in a new catalogue devoted to this series, emphasizes the improved manufacturing methods which have made it possible to furnish cast-iron sectional low-pressure heating boilers of extraordinary size and capacity. Among the features that are given special mention are the comparatively small floor space required by this boiler, as well as the smaller and cheaper foundation, the fact that no steel supporting frame work is required, its lasting qualities, its construction in sections which can be carried through doorways and easily erected, the air-tight iron to iron joints between sections, obviating the necessity of firebrick walls and, finally, the availability of interchangeable boiler parts, making it easy to arrange for an extension of the heating system by adding a sufficient number of sections to the boiler already installed.

This boiler is of the up-draft type, the secondary air rising through the preheating channel in the bridge wall. It will be noted that this air channel extends across the entire width of the bridge wall. It is enclosed on the fire side of the bridge wall by finned removable plates which attain a low red heat, in that way imparting the necessary preheat to the secondary air. This heated air passes up behind the plates and emerges from the top of the bridge wall, mixing at that point with the gases liberated from the fuel.

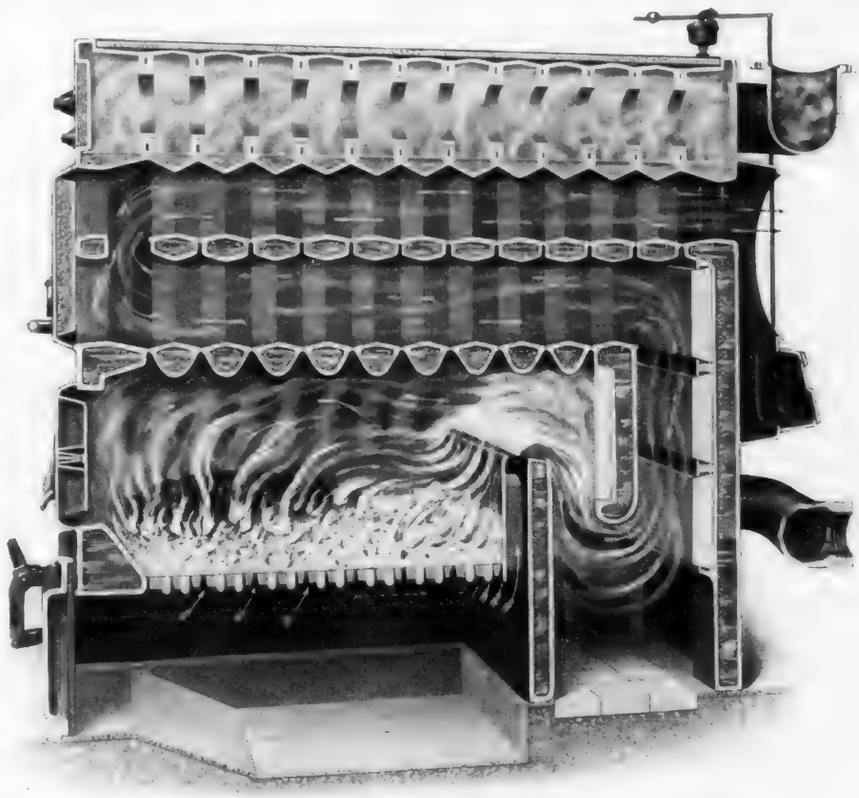
To insure complete ignition of all the gases, this flaming mixture dashes against a highly-heated baffle located just to the rear of the bridge wall section. It then passes downward into a fire-brick lined combustion chamber where combustion is allowed to be completed before entering the flue passages.

In regard to the supply of this secondary air, it is pointed out that the quantity is automatically provided for at the rate of combustion of the fuel.

Clean-out facilities are provided so that accumulations of soot may be easily removed. At the base of the smokehood, for instance, is a clean-out door, provided with a 22-in. round smoke pipe collar. Embodied in this clean-out door is the check draft damper. The entire boiler is enclosed in an indestructible insulating jacket, made of heavy sheet-steel, japanned and lined with asbestos slabs. In this way it presents a notably neat appearance.

In a circular accompanying the catalogue the company states that these boilers are made in conformity with the rating formula of the A. S. H. & V. E. The actual steaming capacities given are certified as being developed without driving and without priming and with ordinary grades of fuel, and with chimneys of the dimensions specified. The revised ratings, states the circular, are literally the ratings originally developed with this boiler and as recorded in the 79-in. water-tube boiler catalogue, issued by the company in 1921.

Many typical installations are included in the catalogue, together with an impressive list of additional installations. Size 7¾ x 10¾ in. Pp. 30.



79-In. Smokeless Water-Tube Boiler for Soft Coal Developed by the American Radiator Company

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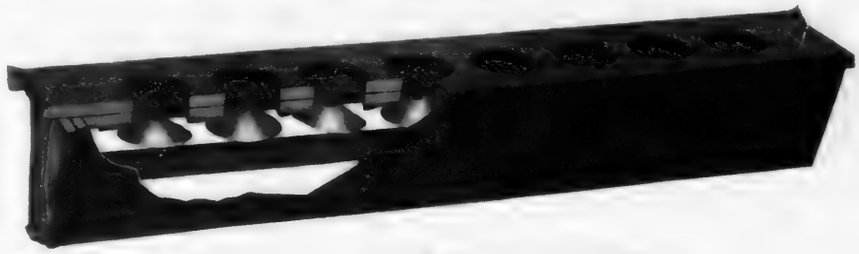
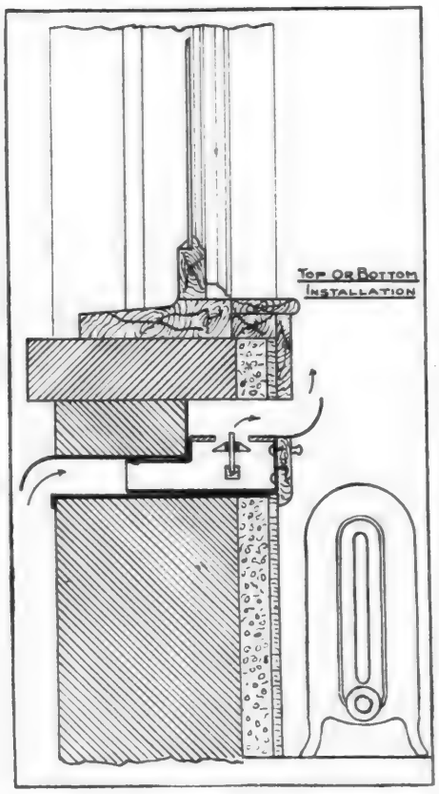
A Novel Type of Window Air Controller

Something new in the way of a window ventilator has been brought out by the Air Control Corporation of New York, 332 East 27th Street, New York, under the name of



Construction of the Siefken Air Controller



Typical Installation of Siefken Air Controller

the Siefken air controller. The interesting feature of its design is the arrangement of disc-like controlling valves which are so weighted as to float upward in proportion to the varying wind velocity. With an increase in the wind they act to close the openings above, at no time, however, cutting off the normal supply of fresh air.

No hinges or pivot bearings are used in this construction. The bodily floating valves are guaranteed mechanically perfect by the manufacturer and noiseless for a term of ten years. The controllers are featured as dust, draft and storm-proof. The liability of the valves sticking, it is stated, is obviated by their design and the metal used in their construction.

As the manufacturer points out, additional exhausting apparatus is necessary for some rooms when using these controllers, and in such cases regular exhaust fan equipment is recommended.

Cast-Iron Boiler Manufacturer Adopts New Method of Rating Product

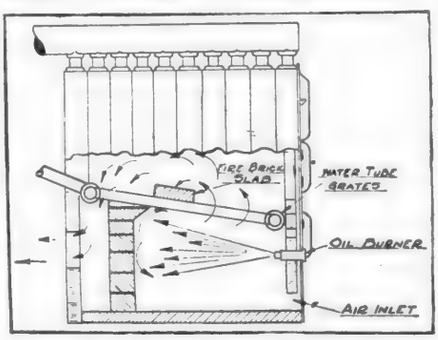
In a new catalogue issued by Hart & Crouse Co., Utica, N. Y., a foreword states that a radical departure is made from any other boiler catalogue ever issued. No arbitrary ratings of the company's boilers, it is stated, are given. The data presented include measurements of all those physical features—grate area, heating surface, water content, steam space, etc., that are useful in determining heating capacity. The catalogue shows how, by following a simple formula, it is possible upon the basis of these facts to select the right size boiler for each requirement.

The catalogue brings out very clearly the down-draft construction and operating features of the Hart & Crouse down-draft smokeless boiler and then proceeds to give tables containing the data referred to, as well as explanations of the more important of these factors.

Attention is directed to the characteristics of the upper and lower grates and different columns in the table show the amount of surface in each grate, as well as the total grate area. Other data include total air space in the two grates and the amount of coal-charging space. Not only is the amount of heating surface given, but also the manner in which this heating surface is distributed.

In presenting figures covering the water content, these are supplemented by figures for the amount of water content between the bottom of the gauge glass and the normal water-line. A feature brought out by these figures is that a large percentage of all the water contained in the boiler lies above the bottom of the gauge glass. A study of these tables, it is stated, will indicate that this boiler can be used on any sort of a blast or unit heater system which requires large volumes of steam to be delivered in short intervals with safety.

In explaining the steps to take in selecting the proper size boiler according to the tables given in the catalogue, the directions given are: (1) Convert the radiation load to its equivalent in direct radiation; (2) add allowance for piping; (3) for steam systems—



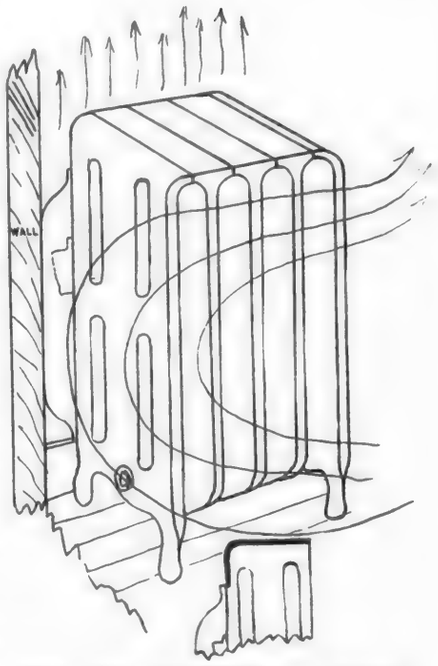
Hart and Crouse Down-Draft Boiler Equipped with Oil Burner

divide the total equivalent direct radiation load (radiation and piping) by 13.8 to determine the amount of heating surface required in the boiler. (Each square foot of 38-in. two-column standard radiation will condense ¼ lb. of steam per hour. Each square foot of heating surface evaporates 3.45 lbs. of water per hour. Therefore, every 13.8 sq. ft. of equivalent direct radiation requires 1 sq. ft. of boiler heating surface). For hot water systems—divide the total equivalent radiation load by 22.4, as in a hot water system each square foot of 38-in. two-column standard radiation gives off 65% as many B. T. U. as in a steam system, so that every 22.4 sq. ft. of equivalent direct radiation requires 1 sq. ft. of boiler heating surface; (4) from the tables given in the catalogue select the boiler containing the heating surface nearest the required amount.

Radiator Designed to Prevent Discoloration of Walls

A radiator resigned to eliminate the streak of grime and dust in walls, ceilings and draperies, and intended for either steam or hot water work, has been patented by Ernest Wykes, a heating and plumbing contractor of Humboldt, Ia.

As shown in the illustration, the air currents flow through the radiator, instead of



New Type of Radiator to Prevent Discoloration of Walls

taking their natural vertical course and are diverted out into the room by closing the top of the radiator sections and a small portion of the back so as to make a flue. A small, separate, adjustable piece of sheet metal is fastened to the back of the radiator below the closed flue portion to divert the air coming up back of the radiator out through the sections into the room.

A water pan is attached to the rear of the radiator to provide moisture to the heated air. Side panels are intended to add to the general appearance of the radiator and afford access to the water pan without exposing this attachment.

In addition to eliminating dirt and grime from the walls, it is claimed that this type of radiator is especially efficient, while the respiratory quality of the air is improved by the moisture. Finally, the top of the radiator is available for use as a shelf. The radiator, which is offered as a substitute for the radiator shield, can be adapted, it is stated, to all heights and patterns. Mr. Wykes's patent (No. 1,469,135) he informs us, is for sale.

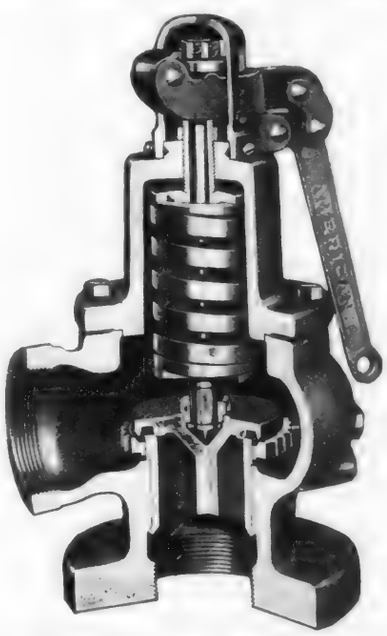
Much constructive work was accomplished at the third annual conference of advertising and sales managers, representing manufacturers and jobbers that contribute to the work of the National Trade Extension Bureau, held recently in Evansville, Ind. The conference, attended by about fifty managers, continued through three days, practically all of the time being given over the transaction of business.

Subjects discussed included sales promotion campaigns, apprenticeship, mailing lists, partial-payment plans in heating and plumbing installations, and standardization of catalogs.

The conference adopted practically the same program of sales promotion that has been in effect during the past year. Apprenticeship was discussed by E. L. Bowman, educational director, of the T. E. B. and by C. B. Conneley, dean of Carnegie Institute of Technology.

New Trade Publications

American Spring Pop Safety and Relief Valves, for stationary, portable and marine use, are discussed in what amounts to a treatise on the subject (Catalogue No. 1400) published by the American Schaeffer & Budenberg Corporation, Brooklyn, N. Y. Of particular interest is the new American Model J high-capacity pop safety valve which is a new achievement of the company. While not universal in its application it is stated to be particularly suitable for water-tube boiler service where saturated steam not exceeding 250 lbs. pressure is encountered. Its exterior design is compact and well rounded,



New Model J, American Pop Safety Valve for Use on Any Type of Boiler

evidently insuring strength at all points. The catalogue includes a capacity table on this new valve which shows it to be of exceptionally high capacity. Size 8 x 10¾ in. Pp. 28.

Clarage Kalamazoo Enclosed Self-Oiling Vertical Steam Engines, Type V, are featured in a timely publication issued by the Clarage Fan Co., Kalamazoo, Mich. The catalogue comes in very pat with the recent discussions regarding electric motor drive for fans and similar units. When automatic regulation with close limits is a necessary requisite, the Clarage Type V engine, it is stated, is particularly adaptable for driving generators, air compressors, line shafting for small factories or shops and similar applications. Where a quickly-responding throttling engine is essential the Clarage Type V is found equally adaptable and the company states that this engine is installed with forced and induced draft fans and in other applications where it is necessary to meet a wide range of speed and load variations. Emphasis is also laid on the complete dust-proof enclosure of the valve mechanism and other vital parts, making it possible to obtain satisfactory service with the engines installed in dusty boiler rooms and other places where the conditions ordinarily would be adverse. These engines are furnished in four general classes, depending upon the operating steam pressure. The high-pressure class operates on pressures ranging from 175 to 250 lbs. gauge, while the fourth class operates on a pressure as low as 10 to 40 lbs. gauge. In addition to views and descriptive matter covering the engine itself, special illustrations are included to show the lubricating system. The concluding pages are devoted to data covering general specifications, tables of horse-powers for each class of engine and dimension tables. Size 8¾ in. x 11 in. Pp. 32.

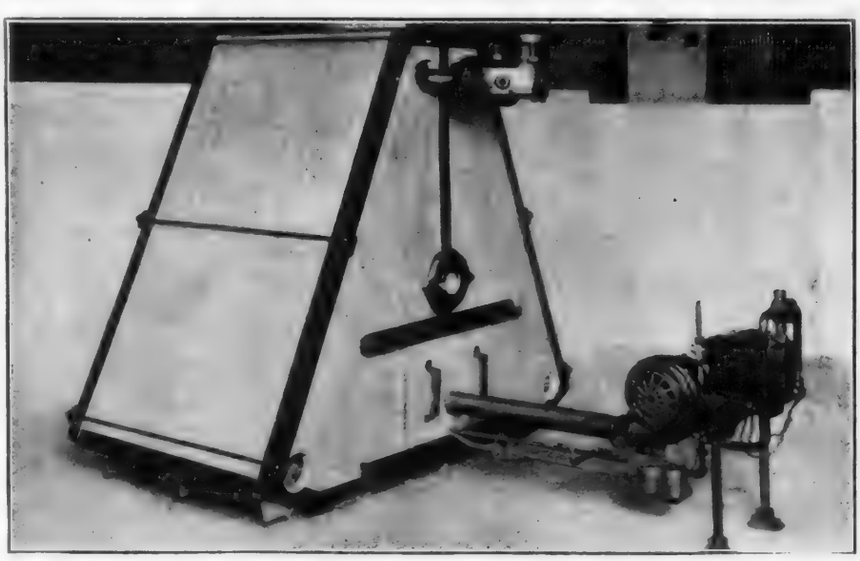
Valve World for November, published by Crane Co., Chicago, contains the Crane Business Survey supplement, reporting business conditions as of October 29. Little change from the previous report was indicated. Business was stable, the Survey stated, with no indication of extreme activity or of depression. The financial situation was sound, with abundant money for all legitimate purposes and failures were decreasing. The demand on manufacturers, the Survey reported, was lighter but only in a normal way, as there is little forward buying so late in the season. Labor, it was found, is well employed although there was not the same demand for men that prevailed earlier in the year. A prominent place is given to a review of Charles Norman Fay's new book "Too Much Government; Too Much Taxation." Another feature is an illustrated article on the new Stroh Building, Detroit, Mich.

Westinghouse Underfeed Stoker, in a new design, is presented in a booklet published by the Westinghouse Electric & Manufacturing Co., stoker department, South Philadelphia Works, Philadelphia, Pa. Large and exceptionally clear views and drawings are presented of the new model stoker. Separate views are included of the various parts, together with a statement of reasons and advantages of particular methods of construction. In this way the reader may obtain a clear understanding of the secondary ram, extension agitating grate, wall supports, air distributing box, Westinghouse patented tuyeres, sidewall tuyeres, windbox dampers, double dumping grates and ash discharge device, all features of the new model underfeed stoker. Size 8½ x 11 in. Pp. 14 and cover.

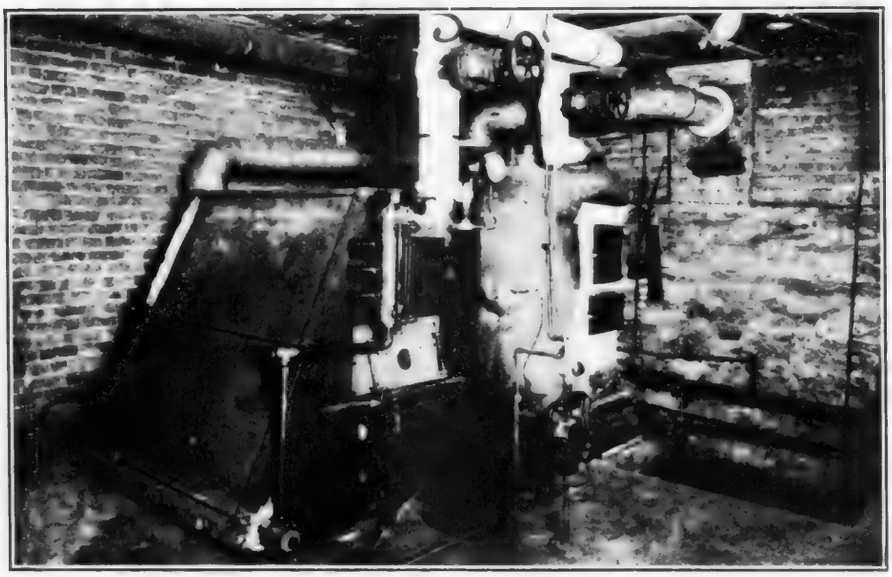
Breese Burnoil Boilers for Nokol Burners are an interesting development described in new circular matter issued by the Breese Engineering Co., 341 East Ohio St., Chicago, Ill. The unique construction of this boiler is designed to give it a large surface exposed to the flame, a smaller volume of water to be heated, the application of heat

Arrangement of Heating Surface in Breese Burnoil Boiler

to the top rather than the bottom of the body of water and an automatic supply of domestic hot water the year round. As will be seen from the accompanying illustrations, the heating unit consists of a series of iron sections or water tubes, set at a slant. These sections are similar in form to indirect ra-



Type A Breese Burnoil Boiler Designed for Use with Nokol Oil Burner

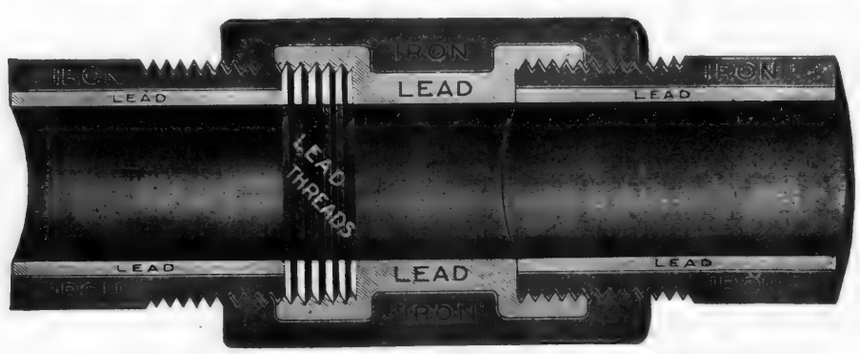


Breese Burnoil Steam Boiler Installation in a City Residence

diators. They have thin walls and present an unusually large water-heating surface. At the same time the tubes hold only about one-half as much water as the ordinary coal-heated boiler. Another point emphasized by the manufacturer in connection with this design is that while the top of each water-column is being heated by the concentration of the greatest heat at that point, the lower portion of each tube acts as a preheater for the cooler water returning from the house circulation. For domestic hot water supply, a pipe within a pipe, or heat exchanger, is provided which causes the hot water from the boiler tubes to heat water for domestic use. In addition to the room-temperature thermostat, installed by the makers of the oil burner, Breese boilers are fitted with a thermostat which is operated by the water temperature. This governs the supply of domestic hot water, the whole arrangement, it is stated, providing a large gallonage of domestic hot water even when the circulating water is heated the house in the coldest weather. One of the new features of this boiler, of course, is its equipment with a Nokol burner.

STANDARD LEAD-LINED IRON PIPE AND FITTINGS, designed especially to obviate corrosion in lines carrying water or acids, is an interesting product of the Lead-Lined Iron Pipe Co., Wakefield, Mass., described and illustrated in a recent catalogue (Catalogue D). In commenting upon the development of this pipe it is stated that the first successful attempt to make lead-lined iron pipe began in Wakefield in 1890. Some of the pipe made then is still in service on the lines of the Wakefield Water Works. In addition to its ability to stand hot and cold water, boiler feed, acids, chemicals, salt water and corrosive liquors, it is featured as being able to stand a high pressure, owing to the combined strength of the two metals. The pipe is first galvanized by the company's own process. In applying the lead lining, after the piping is galvanized, the lead lining is floated into the pipe while the galvanizing is hot, thoroughly fusing the lead to the iron. The company also manufactures tin-lined pipe, substituting tin for lead in the same process. The screwed fittings furnished with this piping are made with from three to four solid lead threads. In the company's line of flanged fittings the lead lining is turned over the face of the flange, making a lead to lead connection. The company also lines all types of valves but recommends the use of the Y or angle-type. Size 3½ x 6 in. Pp. 20.

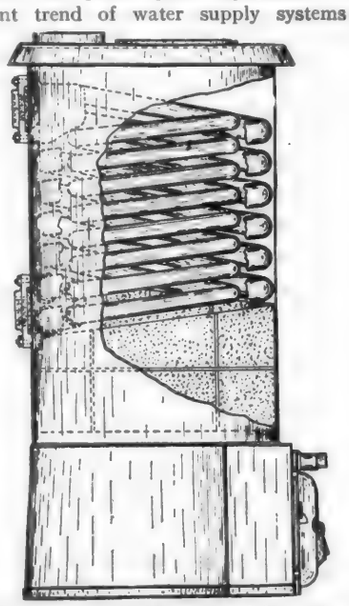
HONEYWELL HEATING SPECIALTIES is the title of an attractive catalog issued by the Honeywell Specialties Co., Wabash, Ind. Particular emphasis is given to Honeywell thermostats and motors because the many advantages of automatically controlled heat has created an ever-growing demand on the part of the public for this type of devices. The catalog is designed for distribution to the trade. Detailed descriptions are given of the various appliances manufactured by the company, including the electric regulator motor, spring and gravity motors. Honeywell thermostats, including the Chronom model 8, model 6 one-day clock, and plain pattern model 4, each designed to meet a particular field. Other specialties described and illustrated include the Honeywell wall plate, testing base, terminal block, motor valve, switches, aquastat, vapostat, damper regulator, heat generator, and water regulator. Size 6 x 9 in. Pp. 36 including cover.



Standard Lead-Lined Iron Pipe Designed to Resist Corrosion

ELECTRIC MOTOR; HOW TO CHOOSE AND USE THEM, is the subject of an interesting booklet published by the Reliance Electric & Engineering Co., Cleveland, O., manufacturers of electric motors. The many advantages of electric power are recounted in a readable manner and detailed information given as to the selection, operation, and care of electric motors. Other contents of the booklet include instructions on installation, determining how much power is needed, load factor and motor cost, methods for determining the size of motor required, description of starters and regulators, how to ask manufacturers for quotations on motors, application of various kinds of motors and the sizes required for various kinds and sizes of machines. Size 3½ x 6 in. Pp. 36.

NATIONAL COIL-TYPE COAL-BURNING TANK HEATERS are among the interesting products described in a general bulletin just issued by the National Pipe Bending Co., New Haven, Conn., devoted to National Industrial and power plant equipment. The present trend of water supply systems to



National Coil-Type Coal-Burning Tank Heater

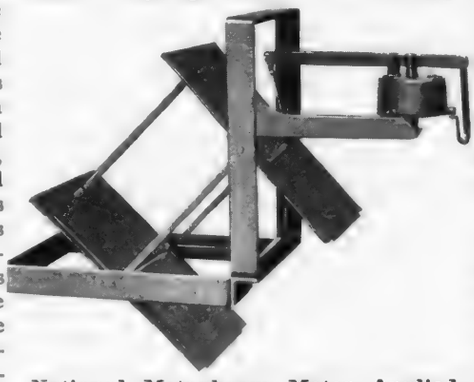
higher pressures, it is stated, necessitates the adoption of heating units having a greater factor of safety than the usual cast-iron tank heaters. The company has long made a coil-type tank heater and has now remodeled and widened this line to meet the demand for an apparatus low in first cost, long lived, with minimum repair cost and low operating cost. Fire is carried inside a fire brick-lined combustion chamber. The water flows through two or more interwound brass coils, wound on a steep "pitch" in order to obtain rapid circulation. The ends of all coils are

brazed into single bronze fittings at each end. These heaters are designed especially for use in house heating work, hot water supply, either alone or in combination with steam; for garage heating, sun-porch heating, or other similar purpose. Size 8½ x 11 in. Pp. 8.

MODERN VENTILATING APPARATUS is the title of the ninth edition of an envelope-size catalog published by the Autovent Fan and Blower Co., Chicago, Ill. The catalog is designed to furnish condensed information of the various types of ventilating fans and blowers, including accessory equipment, manufactured by the company. Direct and alternating-current types of Autovent fans are illustrated, together with tables of prices and performance figures. Accessory equipment described in the publication includes fan guards and other parts adapted to the company's products. An interesting feature of the catalog is a description and illustrations of Autovent portable window ventilators. The latter half of the publication is devoted to various types of blowers. Size 3½ x 6 in. Pp. 34.

INTERNATIONAL ONE-PIPE HEATERS are presented in a folder, reprinting a page advertisement from the *Saturday Evening Post*, just issued by the International Heater Co., Utica, N. Y. The International One-pipe heater is recommended on grounds of economy of first cost, installation, and use of fuel and space in the home. The broadside is directed to dealers who are urged to get into the field for this type of heater.

NATIONAL THERMOSTATIC DEVICES, featuring the product of the National Regulator Co., Chicago, Ill., are presented in a new catalogue (Catalogue D) which will be found a useful addition to the heating and ventilating engineers' files. After discussing the three vital reasons why automatic temperature control should be installed in any building—economy, greater health, and increased production—the catalogue gives some carefully compiled figures showing the savings effected in various classes of buildings equipped with the company's temperature control apparatus. The National thermostat is described at length, as well as the National diaphragm-operated valve, equipped with the company's Metaphram or metallic diaphragm units. An interesting



National Metaphram Motor Applied to Double Damper

section of the catalogue is devoted to National Metaphram motors, with illustrations of their application to double dampers, round dampers and louvre dampers. Under "The Importance of Humidity Control" a description is given of the National pneumatic humidity controller, supplemented by an illustration of a typical installation in a public school. Another section describes National pneumatic apparatus, including an interesting type of small compressor unit. Other devices featured in the catalogue are the A-Jacks high-pressure steam damper regulator, National cam valves for control of blowers, the catalogue concluding with a description, with views, of the National Metaphram low-pressure damper regulator. Many National-equipped buildings are shown, including the Federal Reserve Bank Building, in Chicago. Size 6 x 9 in. Pp. 36.

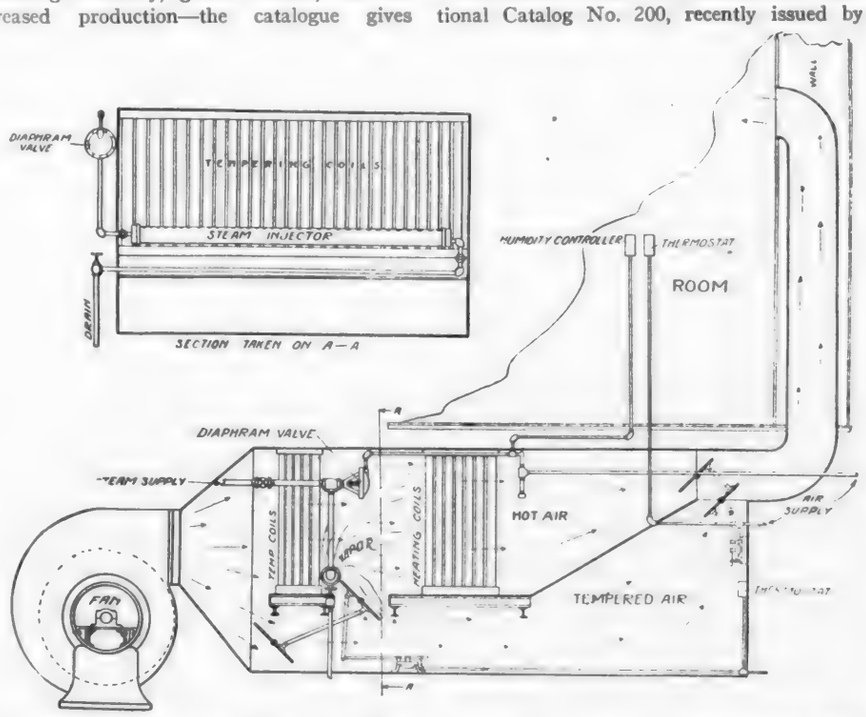
MULTIVANE FANS are featured in Sectional Catalog No. 200, recently issued by the Garden City Fan Co., Chicago, Ill. In addition to describing in detail, together with tables covering dimensions, performance and prices, the company's latest improved type of Cycloidal multivane fans suitable for heating, ventilating and drying plants, similar information is presented of the company's standard steel-plate fans, waste heat fans and heaters and heater units. The catalog is fully illustrated with pictures and drawings of the various types of fans, showing particularly their construction and operating features. Attention is called also to the company's facilities for building special fan equipment in quantities for any requirement. Size 7½ x 10¾ in. Pp. 24.

TYCOS—ROCHESTER, for October, 1923, published quarterly by the Taylor Instrument Companies, Rochester, N. Y., contains articles on the use of thermometers and hygrometers in offices, factories and homes as aids to health and increased production. One article, reprinted from the *Philadelphia Public Ledger*, explains how money may be saved in fuel and doctors' bills by regulating the humidity in proportion to the heat. The publication contains also articles on the weather, history of barometry, weather insurance, movement of storms, use of therometers in the home, and other kindred subjects. Three advertisements, featuring the Tycos temperature control, as the sixth sense of industry, are reprinted in the magazine.

METERING RADIATOR BUSHING, for use in connection with vapor or atmospheric heating and designed to secure easy control, from one central point, of the steam

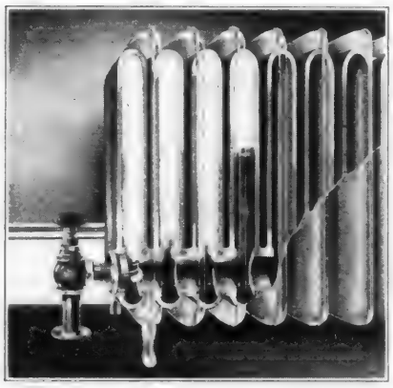
Metering Radiator Bushing

at each radiator of a heating system, thus avoiding the wastes of regulation by individual tenants in buildings with either private or central installations, is the subject of a circular received from the Metering Bushing Sales Co., 300 First National Bank Building, Virginia, Minn. This device, it is stated, makes possible the use of steam-type radiation for vapor or atmospheric systems and makes it as easy to control central station heating supply as individual heating plants. Since the previous description of this bushing in our columns, some months ago, the bushing has been still further developed. It is designed to replace the radiator bushing in the steam supply opening of the radiator. By means of a carefully-machined opening, whose length and diameter are computed on a basis of the size and type of radiation and the steam pressure, the amount of steam flow is proportioned to the service expected from the radiator.



Typical Installation of National Thermostatic Devices in Connection with School Heating and Ventilating Equipment

This adjustment for each radiator is designed to assure to each the correct amount of steam, regardless of whether it is located at the far end of the system or close to the supply. Also, with this arrangement, it is stated, the temperature



Typical Installation of Metering Radiator Bushing

can be reduced during the night throughout the building by reducing the pressure. In this way the device is able to take care of those conditions where the tenant leaves the windows open or closed. Size 8½ x 11 in. Pp. 4.

WEATHER VEIN, Vol. 3, No. 6, the bimonthly periodical of the Carrier Engineering Corporation, Newark, N. J., details the trip of its editor, Esten Bolling, to Europe. This account, it must be admitted, aroused many envious thoughts on the part of his less fortunate contemporaries. There is also an interesting description of the heating and ventilating equipment for the New London County Council Hall, which is characterized as "undoubtedly the most unique application of scientific air conditioning in existence." The number contains an index of the three volumes of *The Weather Vein* published to date.

BULLETIN OF THE NATIONAL DISTRICT HEATING ASSOCIATION for October, 1923, is featured as the association's annual heating rates number. It contains a valuable compilation of the heating rates now in effect in no less than 135 cities and embracing 137 utility companies. Every care has been taken to bring the figures up to date. The publication will be found of great value to heating companies everywhere in providing a convenient method of comparing their rates with those in effect elsewhere and, in many cases, suggesting variations which will render the rates more equitable. In the editorial section of the *Bulletin* J. Earl Seiter contributes a description of a recording steam demand meter with unusual features.

Employment Service for Corporations, organized to meet the needs for a high-grade organization to bring together good men and good positions, is brought to the attention of the profession in a circular issued by William L. Fletcher, Inc., 651 Boylston St., Boston 17, Mass. The company, it is emphasized, is conducted as a corporation service and not as an employment agency. It acts as the agents of employers in locating executives and young men and women to be trained for executive positions. All charges for placements are paid by the employers.

Death of Lewis H. Nash

LEWIS H. NASH, president of the Nash Engineering Co., South Norwalk, Conn., and inventor of the Nash Hytor air compressor and vacuum pump, died November 17, after a brief illness. He was 71 years old. Mr. Nash lived to see his pump idea develop from a small local business to one of the largest of its kind in the country, all within a period of a little over a decade. He was born in South Norwalk and after an early apprenticeship at the Norwalk Iron Works, entered Stevens Institute from which he was graduated in 1877 as a mechanical engineer. In 1921 the Institute conferred upon him the degree of doctor of engineering.

From 1877 to 1905 he was chief engineer of the National Meter Company, of Brooklyn, and was the inventor of the Nash water meter and the Nash gas engine made by that company.

In 1911 he organized the Nash Engineering Company to manufacture a new air compressor and vacuum pump he had designed. From a small start the business grew rapidly and these pumps became known wherever air compressors and vacuum pumps were used. The company also developed the Jennings return-line heating pump, as well as boiler-feed pumps and laboratory pumps, all of which have become nationally known. In fact the company's plant has more than trebled in size during the past few years. During the World War the plant was largely devoted to the manufacture of gas compressors for the government.

The late Lewis H. Nash

Mr. Nash was a member of the Connecticut General Assembly and was a member of the Committee on Banks and on Unfinished Business. He was one of the oldest members of the Norwalk Yacht Club, South Norwalk Club and other social organizations. He is survived by a widow and two sons and two daughters. He also leaves three brothers and one sister.

Deaths

WILLIAM F. WENDT, founder and former president of the Buffalo Forge Company, died at his home in Buffalo, N. Y., October 30 last. He was a brother of Henry Wendt who is now president of the Buffalo Forge Company. Mr. Wendt retired as the head of the company in 1916 but continued until two years ago as president of W. F.

The late William F. Wendt

Wendt Publishing Co., which issued *La Hacienda*, printed in Spanish and circulated in South America. He was president also of the George L. Squier Manufacturing Co., and the Buffalo Steam Pump Co. Mr. Wendt was active for many years in Republican politics in his native city of Buffalo and while he never sought office, was prominently mentioned several times as Republican candidate for mayor of Buffalo.

EDGAR E. STRONG, who founded the Strong, Carlisle & Hammond Co., Cleveland, O., and who was a Civil War veteran, died recently. He had headed the business which he organized for 36 years and was known wherever mill supplies are handled. Mr. Strong was born near Manchester, Conn., April 14, 1841. He located in Cleveland after the Civil War, being connected for twenty years with the W. Bingham Co., before forming the partnership with R. H. Carlisle and W. J. Turney, the latter disposing of his interest later to L. J. Hammond. A son, Herbert W. Strong, is a member of the present firm.

CHARLES C. JENKS, a director of the United States Radiator Corporation, and formerly president of the company, died suddenly in his suite at the Jefferson Hotel, Richmond, Va., while on a trip in the South. He had lived in Detroit since 1875 and was born August 25, 1854 at St. Clair, Mich. He was noted for his application to work and had risen from bookkeeper to one of the most influential business men and bankers in Detroit. He resigned as president of the United States Radiator Corporation in January 1921 but had continued a member of the board of directors

Present A Buyers' Market

Christmas Business Depends Upon Wise Selection of Merchandise—Purchasing Reserve Accumulates

Especially Prepared for THE HEATING AND VENTILATING MAGAZINE

BY L. W. ALWYN-SCHMIDT

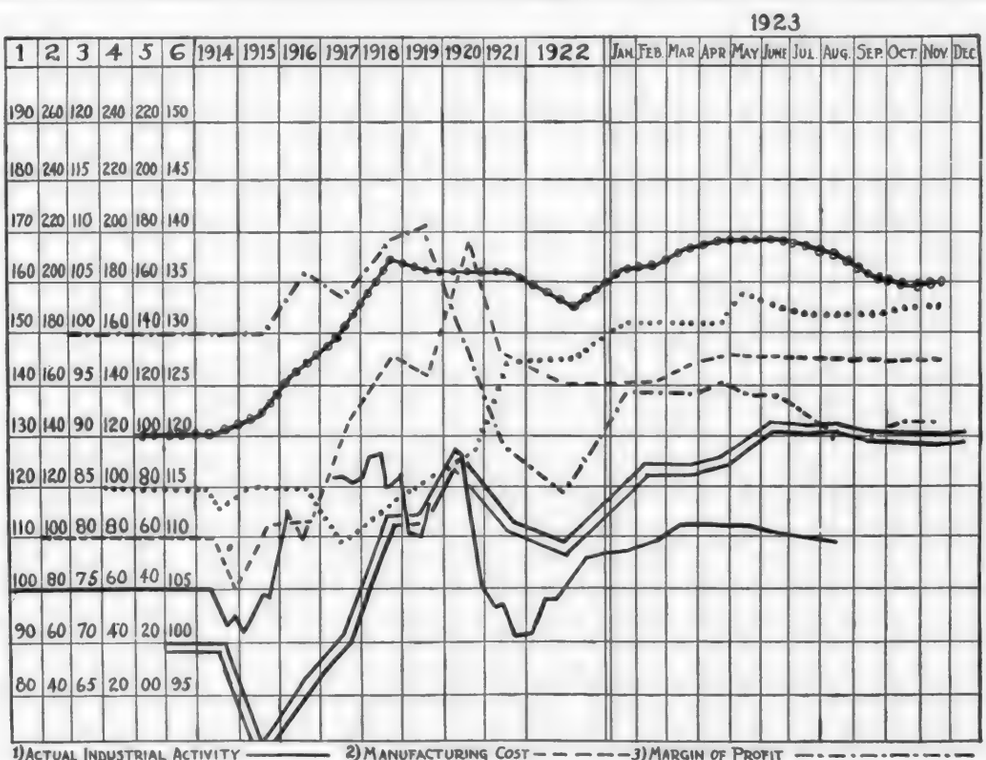
Rarely has there been in recent years a market condition like the present, where many of the acknowledged indicators of the economic barometer appear to show storm readings, but where, at the same time, ocular evidence seems to contradict the findings of the analytical economist. An explanation most likely is to be found for this peculiar situation in the underlying structural strength of our present economic prosperity. This has been an important factor all through last summer and autumn. Possibly the wage earner who has so carefully guarded his savings all along has come to the conviction that this policy is not a wise one to follow much longer in view of the many attractive prizes offered in nearly all fields of production. Because whatever statistics may show, this just now is a bargain hunter's time where ready money, spent wisely, has a very satisfactory purchasing power.

The extent of the Christmas business, therefore, will be very much a matter of adjustment of sales prices and especially of selection of merchandise. Industry and distributor are often inclined to misjudge their opportunities in this respect in a mistaken attempt to cut prices where a wiser selection of merchandise would have been a better policy. It has been proven repeatedly that the cost of an article by itself is no deterrent for the buyer if it is high, nor an inducement if it happens to be low. More important for the resulting sale is that the character of the article should appeal to the customer. Hence the latent purchasing power of our national consumer can be turned into active purchasing energy only by a careful selection of the merchandise offer, eliminating in this manner the obvious drain upon industrial earnings which always must follow a general lowering of prices.

The latter in fact is a condition that should be avoided most carefully in view of the fact that manufacturing profits have been cut already very finely during the last months. Especially as there is little hope for the manufacturer to improve his profit margin by reducing manufacturing costs in the near future. But the production of merchandise attractive to the consumer should not provide any unsurmountable difficulty for our industry. It may mean a short cut in manufacturing practice in one case, standardization of types in another, limitation of selection in a third. But a way will be found most certainly and has been found by certain industries already, with the result that business in these branches continues to be good or is reviving most rapidly.

This process of modification, standardization, and limitation somehow finds a particular fruitful ground in our own American industrial soil. It fits in well with American labor conditions, engineering practice and the general trend in our economic life. It will provide the solution for our present economic problem by providing a proper balance between the consumer's ability to pay and inclination to purchase, on one side, and the desires of our industry to produce salable merchandise economically on the other. But this balance can not be obtained completely if not supported by a policy of reasoned industrial protection. This is why the protective tariff policy plays so different a part in the economic life of the American nation from that of the considerably smaller economic entities of Europe, for instance. Protection in our case does not mean anything but protection of the economic balance of our own market against the appearance and influence of foreign factors likely to disturb its equanimity. If proof were needed of the correctness of this contention it has been fully provided by the recovery of our markets following the recent readjustment of the tariff and the comparative absence of such disturbing incidents as labor troubles in the so-called key industries.

There is no doubt now that the economic forward movement caused by the various forces acting during the early part of the



Analysis of Business Conditions at End of November

year has come to an end and that the flattening out of the curve has become permanent. But the elevation of the curve remains high. It is very much higher than could be expected reasonably and gives cause to expect that any new forward movement will exceed even the high points reached during last summer. But it is very difficult to predict when this new forward movement will take its start. The larger the quantity of the matter, the deeper and broader the flow of the current, the more powerful also must be the force to set it in motion. It is this very absence of locomotive forces which illustrates the strength of our present market situation.

There is, on the one side, the consumer, well employed, well paid and well secured in his position by invested savings. And on the other stands the producer with a productive equipment, fully paid, with sufficient funds for further expansion and backed by a banking organization which easily may be called the strongest in the world. The two combined acting in turn as buyer or seller provide today the material from which must come any new energy to move the economic curve.

For the time being little more can be expected than a good Christmas business with a turnover most likely larger than that of last December. But as time goes on, the position of the purchaser will improve. Prices for life's indispensable necessities are not increasing sufficiently to deplete his savings or to weaken his surplus of earning power over ordinary spending requirements. So after a while the influence of the steadily accumulating purchasing reserve will make itself felt by an increase in the desire to buy. Today this desire is still not large enough to produce any effect on the market. It is not sufficiently diversified and numerous to end the deadlock. But pending an actual catastrophe it must come to a point where it becomes more desirable for the savings bank holder to turn money into more tangible assets, and buying will begin on a scale large enough to be felt, first in the retail stores and a little later in the factories.

In the mean time manufacturers and dealers will have little cause for worry.

Problems of Electric Drive for Ventilating Equipment

Problems connected with direct-connected motor-driven fans were discussed at the November meeting of the New York Section of the American Institute of Electrical Engineers, held November 14, in the Engineering Societies Building. Among the speakers were C. A. Booth, of the Buffalo Forge Company; F. R. Still, of the American Blower Co.; C. F. Scott, of the General Electric Co.; and J. L. Yardley, of the Westinghouse Electric & Mfg. Co.

Mr. Still, after discussing the difficulties in connecting low-speed heating and ventilating fans directly to alternating-current motors, expressed the opinion that where alternating-current motors have to be used for that purpose, the best solution is belt drive from an alternating-current motor.

This view was endorsed by Mr. Booth. As usually applied for commercial work, there is no space limitation that is likely to prohibit the use of belt drive for fans. Belt drive, he said, is by far the most common arrangement for heating, ventilating and drying fans in factories, the pulley ratio averaging about 4 to 1.

Mr. Scott's paper was entitled, "The Application of Electric Motors to Blowers." Direct-current motors for blowers used in ventilating systems, he said, should be shunt wound. He also advocated belt or chain drive with alternating-current motors when driving slow-speed fans and emphasized the importance of width, thickness, number of piles, speed, etc., in the selection of belts. By choosing of the right chain speed and the proper pitch, angle and tightness, he said, chain drive can be made quiet. He spoke of a method of insuring quiet chain drive by incasing the chain and running it in oil.

Mr. Yardley's paper called attention to problems involved in applying motors to fans. The present tendency to increase normal fan speeds has materially increased the number of fan applications that may now be directly driven by electric motors. To meet all the conditions as to horse-power and speeds required in ventilating work, a wide variety of ratings of motors has become necessary, these ratings now running up into the thousands. He expected this condition to continue and foresaw a very general use of direct-connected variable-speed direct-current motor drive for ventilating fans in schools and public buildings, and mentioned the item of cost as their only disadvantage.

The ensuing discussion brought out the need of closer co-operation between the fan and motor manufacturers so that motors of standard ratings and speed could be more generally utilized.

F. A. Combe to Act as Central Station Heating Expert for Dominion Fuel Board

Announcement has been made of the appointment of F. A. Combe, consulting steam and combustion engineer of Montreal, Canada, and chairman of the Fuel Committee of the Engineering Institute of Canada, to act as the central station heating expert of the Dominion Fuel Board. As announced in THE HEATING AND VENTILATING MAGAZINE for October, 1923, the Dominion Fuel Board recently adopted a resolution "to proceed immediately with the investigation of central station heating, with particular reference to the extent to which their more extensive use may contribute to the solution of the fuel problem."

Mr. Combe's investigation will be conducted under the supervision of the Dominion Fuel Board and it is stipulated in the agreement with him that his report must be completed within six months. He will deal not only with the history of central heating wherever it has been tried out and give descriptions of existing plants in the United States and Canada, but will also pay particular attention to the saving that can be effected by using low-grade fuels in these plants. Other phases of the subject to be dealt with will be reasons for failure in unsuccessful central heating enterprises, possibility of combining electric generating and heating service and of using plants for making ice in summer, diagrams and plans of plants, rates, regulations, approximate costs, capital required and probable profits.

Mr. Combe has specialized in central heating work and has been connected with the establishment of several central heating plants, including that at McGill University.

Standardization Work Among the Heating Contractors

Progress in the work of standardization was reported by the Standardization Committee of the Heating and Piping Contractors' National Association, at its meeting held October 29. The "Engineering Standards" manual compiled by this committee, of which Walter L. Fleisher, of New York, is chairman, and which contains up-to-date rules for estimating radiation, has been well received, the commendations, it was reported, far outnumbering the criticisms. Letters from widely-separated parts of the country show that the manual is being used with satisfaction in many quarters under all kinds of conditions.

Another accomplishment reported by the committee is the establishment of a standard of 3¼ in. as the "center of valve to face of inlet spud" dimension for ½-in. return-line vacuum valves. This has been accepted by most of the manufacturers and becomes effective as a standard January 1, 1924.

Among the subjects to be considered by the committee during the coming year are radiator emission factors, exposure factors for cities not already computed, and boiler selection.

New Books

WEATHER PROVERBS AND PARADOXES, by William J. Humphries, Ph. D., meteorological physicist of the United States Weather Bureau, is the title of a new book which will have special interest to heating and ventilating engineers who deal with the weather as they find it or manufacture their own weather. In the first part of the book the author has collected most of the important weather proverbs that have been handed down through the years and has separated the true and useful proverbs from the false and misleading. The second section, which will probably have a greater appeal to heating men, deals with meteorological paradoxes, such as "air pushed north blows east," "rain dries the air," "more air goes up than ever comes down," "to warm air, cool it," etc. While these statements are to be taken literally, by themselves they express only part of the facts in the matter, all of which are made clear and are found to be in conformity with Nature's laws when properly explained. Size 5 x 7½ in. pp. 125. Published by Williams & Wilkins Co., Baltimore, Md. Price $1.50 postpaid.

Among the papers read at the recent annual meeting of the American Institute of Chemical Engineers, in Washington, December 5–8, was one on "Thermal Research as a Guide to Engineering Research," by H. C. Dickinson. The association held its sessions at the New Willard Hotel and the inspection trips included a visit to the Bureau of Standards and another to the Geophysical Laboratory of the Carnegie Institution in Washington.

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How to sell Ideal Super-Packless Valves

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IT doesn't matter whether jobs be large or small—steam, water, vacuum or vapor—Ideal Super-Packless Valves will add to each of them advantages that no other valve can give.

Opened or closed with one easy turn—these valves bring convenience as well as absolute protection against leaks that make customers dissatisfied.

They mean more to you, too, because they not only keep customers reminded of your interest in their comfort, but the additional profit makes every job of more value to you.

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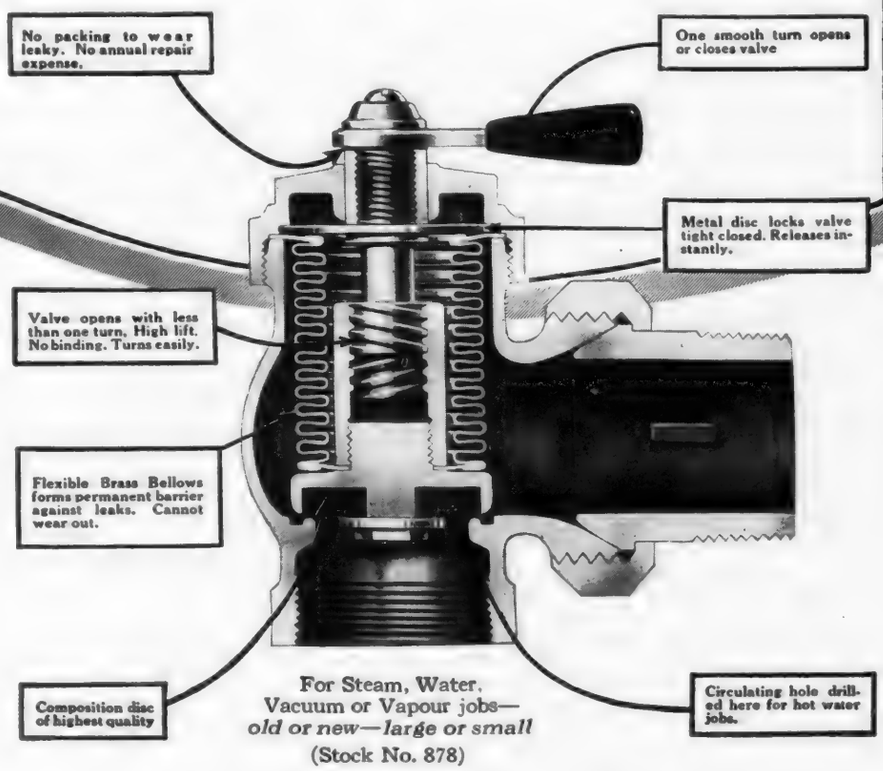
No packing to wear leaky. No annual repair expense.
One smooth turn opens or closes valve
Metal disc locks valve tight closed. Releases instantly.
Valve opens with less than one turn. High lift. No binding. Turns easily.
Flexible Brass Bellows forms permanent barrier against leaks. Cannot wear out.
Composition disc of highest quality
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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

VENTILATION

Air Required to Dilute Automobile Exhaust Gases to Safe Proportions in Air Breathed

(Car tested under summer conditions unless otherwise stated)

Number of Cars Tested	Type of Car[1]	Speed, miles per hour	Average carbon monoxide in exhaust gas: Per cent	Average carbon monoxide in exhaust gas: Cu. ft. per hr., per car (at 65° fahr., 29.92" Hg)	Cu. ft. per min. of ventilating air per car required to dilute carbon monoxide to 1 part per 10,000 (safe for indefinite period)
		Engine Idling			
5	5P	Car standing	7.3	39.2	6533
7[2]	7P	"	6.3	35.3	5883
5[2]	1½T	"	7.1	31.0	5167
4	1½-3	"	2.4[3]	13.2[3]	2200[3]
3	3½-4½	"	8.8	66.4	11070
6	5T	"	6.8	50.5	8417
		Engine Racing			
5	5P	standing	7.1	76.9	12820
7[2]	7P	"	7.8	137.0	22830
5[2]	1½T	"	7.7	67.9	11320
4	1½-3	"	4.7	55.8	9300
3	3½-4½	"	8.6	158.2	26370
6	5T	"	7.5	105.2	17530
		Average Load and Level Grade			
11[3]	5P	3	6.7	36.3	6050
7[2]	7P	3	6.6	53.1	8850
5[2]	1½T	3	7.8	47.4	7900
22	1½-3	6	7.3	67.6	11270
16	3½-4½	6	7.8	92.6	15430
18	5T	6	7.5	110.3	18380
9	5P	10	7.8	44.1	7350
6	7P	10	8.3	75.5	12580
7	1½T	10	7.6	58.7	9783
20	1½-3	10	7.5	104.0	17330
13	3½-4½	10	7.5	147.6	24600
12	5T	10	6.9	151.6	25270
9	5P	15	6.8	57.9	9650
6	7P	15	8.6	111.8	18630
7	1½T	15	6.7	77.2	12870
15	1½-3	15	6.2	103.9	17320
5	3½-4½	15	4.8	131.2	21870
		Full Load and 3% Grade Upward			
7[2]	7P	3	8.4	88.5	14750
5[2]	1½T	3	9.5	65.1	10850
22	1½-3	6	6.9	114.3	19050
16	3½-4½	6	6.9	148.1	24680
18	5T	6	6.1	163.3	27220
6	7P	10	8.9	117.2	19530
7	1½T	10	7.3	86.3	14380
22	1½-3	10	6.7	149.6	24930
16	3½-4½	10	6.1	88.5	14750
18	5T	10	4.9	199.3	33220
13	7P	15	8.3	146.7	24450
12	1½T	15	6.9	117.7	19620
15	1½-3	15	5.4	130.1	21680
16	3½-4½	15	4.1	181.7	30280
		Accelerating up 3% Grade with Full Load			
7[2]	7P	0 to 15	6.5	163.6	27270
5[2]	1½T	0 to 15	5.4	65.9	10980

[1] Types are designated thus: 5P and 7P represent 5 and 7 passenger cars, 1½T, 1½-3, 3½-4½ and 5T represent trucks of the respective tonnages.
[2] Tested under winter conditions.
[3] These averages are undoubtedly too low to represent correctly the type of trucks. All cars were tested with carburetors set as submitted by the car owners. These four happened to be set for lean mixtures.

(Published by permission of U. S. Bureau of Mines)

VENTILATION—Air Required to Dilute Automobile Gases. | **No. 7-B**

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

WATER HEATING

Figuring Friction Heads

In the accompanying diagrams, which are based on tests made by Professor F. E. Giesecke, head of the Division of Engineering Research, University of Texas, and which allow for increase of friction due to age, the sloping lines represent the nominal diameter of the pipe in inches and the sloping dotted lines represent the velocity of the water in inches per second (not in feet, as might be supposed).

To understand the use of these charts, note from Data Sheet 133-Q that when 200 gal. per minute flow through a 6-in. pipe, the friction-head is 4/100 in. per foot of pipe and the velocity of the water between 24 in. and 36 in. per second; also that for 30 gal. and a 2½-in. pipe the friction-head is 1/10 in. per feet of pipe and the velocity slightly less than 24 in. per second.

From Data Sheet No. 133-R, when 200 gal. of water per minute are flowing through a 6-in. pipe, the velocity of the water is between 24 in. and 36 in. per second, and the friction-head is about 6/100 in. of water column for each elbow; also for 30 gal. and a 2½-in.-pipe, the friction-head is about 53/100 in. per elbow, and the velocity slightly less than 24 in. per second.

PRACTICAL APPLICATIONS

Example 1. **What pressure-head must be maintained by the pump shown if 10 gal. per minute flow through a 1-in. pipe 142 ft. long and containing seven elbows?**

We find from Data Sheet 133-Q that for 10 gal. per minute flowing through a 1-in. pipe, the velocity is practically 44 in. per second and the friction-head per foot of pipe is 1.05 in., and from Data Sheet 133-R that the friction-head per elbow is practically 2.8 in.

It should be noted here that the velocities shown in Data Sheet 133-R are not those in the elbow but those in the pipe which the elbow fits.

The total friction-head is, therefore,

142 x 1.05 = 149.2 for the pipe
7 x 2.8 = 19.6 for the elbow
Total 168.8 in. of water column.

The velocity head is $\frac{4 \times 4}{\epsilon 4\,4} = 0.25$ feet or 3 in.

Therefore, the pump must maintain a pressure-head of 169+3=172 in., or 14.3 ft. of water column, or 6.2 lbs. per square inch: The water will be thrown about 3 in. into the air if it isdischarged from the open end of the 1-in. pipe.

ANOTHER EXAMPLE

Example 2. What pressure must be maintained by the pump in the system described in Example 1 if 12½ gal. of water flow through the pipe and if an open globe valve is added to the line?

Note that the friction in an open globe valve is approximately equal to that in twelve elbows and proceed exactly as in Example 1. The velocity is about 4.5 ft. per second and, therefore, the velocity-head is 4 in. The friction-head is about 1.6 in. per foot of pipe and 4.3 in. per elbow. The total friction-head is 142 x 1.6 + 19 x 4.3 = 25.8 ft. and the total pressure-head is 26.1 ft.

(Continued on Data Sheet No. 133-Q)

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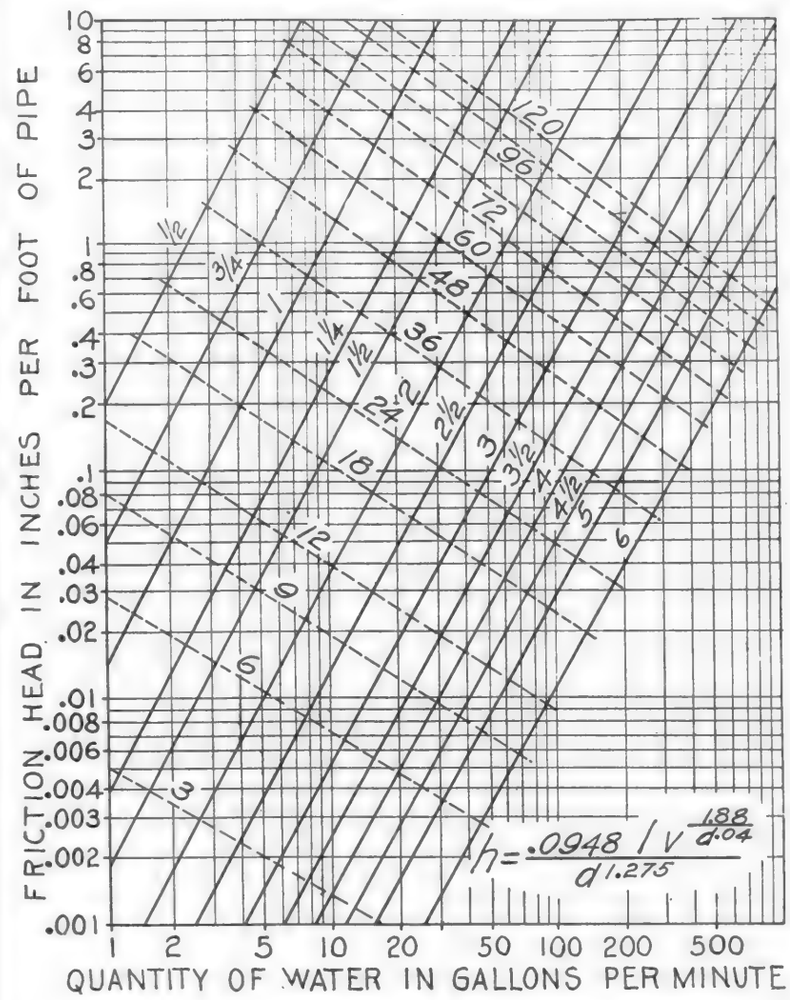
THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

WATER HEATING

Figuring Friction Heads

(Continued from Data Sheet No. 133-P)



(Concluded on Data Sheet No. 133-R)

WATER HEATING—Charts for Figuring Friction Heads. | No. 133-Q

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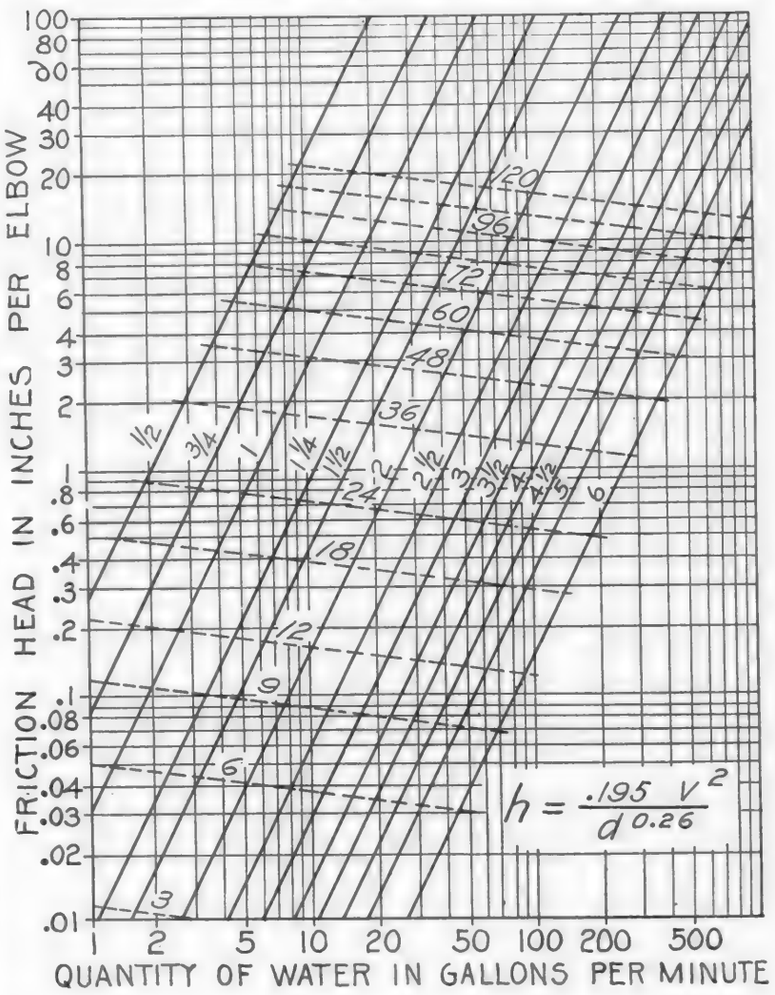
THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

WATER HEATING

Figuring Friction Heads

(Concluded from Data Sheet No. 133-R)



WATER HEATING—Charts for Figuring Friction Heads. | No. 133-R

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- Stanley Company of America
- City Center Building
- Corn Exchange National Bank
- Ford Motor Company
- Public Ledger Building
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- Fayette R. Plumb, Inc.
- Packard Motor Car Company
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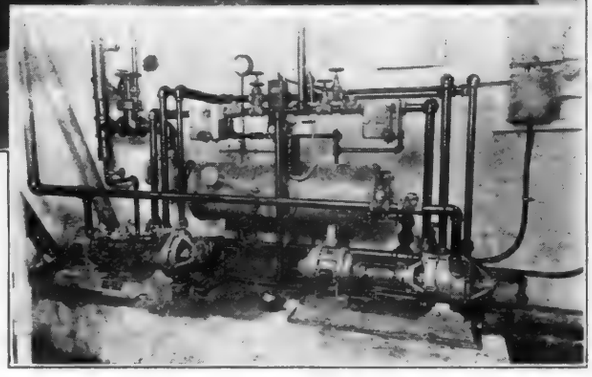

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Capacity each pump 40,000 sq. ft. direct radiation, air capacity 25 cubic feet per minute in addition to a water capacity of 60 gallons per minute. The motors are only 3 horse power.

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Trade and Miscellaneous Notes

Coming Events

Jan. 22-26, 1924.—Annual meeting of the American Society of Heating and Ventilating Engineers, in New York.

Miscellaneous Notes

Chicago, Ill.—The Heating and Ventilating Committee of the Fourth Annual Chicago "Own Your Home" Exposition has been named and will have charge of the arrangement of exhibits of this field in the exposition to be held in the Coliseum, March 22-29, 1924. Charles D. Allan, president of the Illinois Chapter of the A. S. H. & V. E. is chairman of the committee. The other members are: Charles F. Newport, treasurer of the Newport Boiler Company; William H. Chenoweth, district manager for Warren Webster & Company; William T. Dean, president of the Combustion Company and president of the National Oil Burner Equipment Association; August Kehm, president of Kehm Bros. Co.; John M. Frank, vice-president of the Electric Ventilating Company; Benjamin Nelson, of the Continental Machinery Company and former president of the Illinois Chapter, A. S. H. & V. E.; and A. H. Richardson, Jr., of Richardson & Boynton Company.

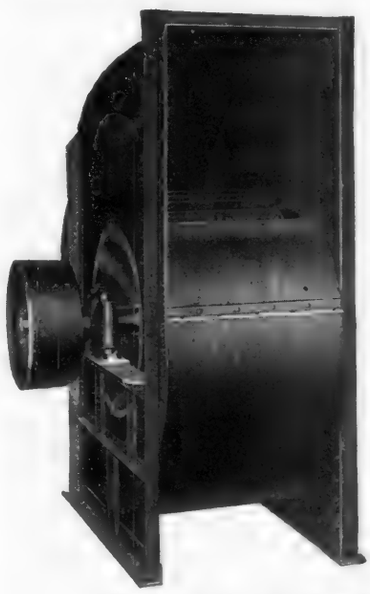
Chicago, Ill.—A campaign is being waged by Health Commissioner Bundesen to eliminate the time limit in the minimum heat ordinance which prescribes the temperatures for apartment buildings. Under present conditions, a minimum of 68° F. must be maintained between October 1 and May 1, but for the five other months of the year "the tenant is at the mercy of the lake breezes and his landlord." For the last ten years, according to the health department, 14.4 days of every May have registered a temperature of 55° F. or less.

National Boiler and Radiator Manufacturers' Association met in Chicago, November 14, to transact routine business. President Edward Norris, of the Utica Heater Company, presided.

Washington, D. C.—Recommended minimum requirements for masonry wall construction are contained in a tentative report of the Building Code Committee of the Department of Commerce, dated September 1, 1923. The requirements are briefly stated in the form of recommendations suitable for municipal adoption. This report, it is emphasized, is strictly tentative in nature and discussion is requested. Comments should be addressed to the chairman, in care of the Division of Building and Housing, Department of Commerce, Washington, D. C.

Pittsburgh, Pa.—That labor unions as well as employers are growing more and more concerned about the apprentice problem is shown in two recent developments toward the training of apprentices at Carnegie Institute of Technology in Pittsburgh. In both of these developments, the local labor unions have taken the initiative in seeking the apprentice training. One of these organizations is the local of the International Wood, Wire and Sheet Metal Lathers union which has affected a working agreement with Carnegie Tech whereby the union apprentices to the union will be trained there. As a result of this agreement, 15 apprentices have been recently enrolled at the institute and are compelled by the union to attend night school classes at three nights a week for the next two years. The other development is the result of an agreement between the Local Union No. 12, Amalgamated Sheet Metal Workers' International Alliance and the Sheet Metal Contractors' Association of Pittsburgh. Subsequent to this important partnership between organized labor and the employers, a group of more than 60 sheet metal apprentices is now enrolled at Carnegie Tech to receive training one full day a week for the last four years of the five-year apprenticeship period. The agreement takes on added significance from the announcement

UNIBLADE PULLEY DRIVEN BLOWERS



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Built for durability, accurateness of performance, quietness of operation and neatness of appearance, they are applicable to all heating, ventilating and drying installations.

Bulletin No. 58 will convince you that this equipment deserves your consideration. Write for it.

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that the employers have agreed to pay the apprentices their full wages for the day they spend in classes; and the union officials have taken the responsibility of compelling attendance at classes.

National Warm Air Heating and Ventilating Association held a mid-year meeting in Urbana, Ill., December 4, at the Urbana-Lincoln Hotel. One of the important subjects discussed was that of "test-house," for carrying out more extensive tests of warm-air furnace heating systems.

Range Boiler Sizes will be reduced from 130 to 13, commencing July 1, 1924, according to an agreement reached by manufacturers, distributors and jobbers of range boilers and other interested groups, held at the Department of Commerce, October 30.

American Gas Association, at its annual convention in Atlantic City, October 15-20, appointed a special committee to study and report on the subject of closer co-operation between the association and master plumbers and heating contractors. Among the exhibitors were: M. T. Davidson Co., New York, Davidson steam and centrifugal pumps; Gas Utilities Corporation, Philadelphia, Hot Wave automatic gas-fired boilers for steam, water and vapor heating systems; Honeywell Heating Specialties Co., Wabash, Ind., Honeywell specialties, including the Honeywell motor valve, combining an electric motor with a new type of gas valve in one unit, to be controlled by a room thermostat; Johns-Manville, Inc., New York, insulating materials; H. Mueller Mfg. Co., Decatur, Ill., gas tools and appliances; Bryant Heater and Mfg. Co., Cleveland, O., tubular gas boilers for house heating, etc.; Reznor Mfg. Co., Mercer, Pa., room heaters; Ofeldt Gas Fired Boiler Co., Nyack, N. Y., gas-fired industrial and house-heating boilers; Trolley Supply Co., Gas Appliance Division, Massillon, O., Franklin gas-steam radiator and other products; A. H. Wolff Gas Radiator Co., New York, gas-fired steam radiators, etc.; United Utilities & Engineering Co., Lansdale, Pa., Heatomat gas-fired boiler; Automatic Gas-Steam Radiator Co., Brooklyn, N. Y., gas-fired radiators and heaters; and American Gas Appliance Co., Brooklyn, N. Y., gas-fired radiators.

Boston, Mass.—New England oil burner manufacturers and distributors have organized the New England Oil Heating Association. Parker B. Fiske of the Domestic Oil Heating Co., Boston, was elected president.

Buffalo, N. Y.—Plans have been worked out for close co-operation between the journeymen's organizations, employer organ-

PRACTICAL AND ECONOMICAL

VENTILATION IS OBTAINABLE AT AN AMAZINGLY LOW FIRST AND MAINTENANCE COST WITH

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izations and the Department of Education in launching a course in plumbing and steamfitting in the new McKinley High School in Buffalo, N. Y. An advisory committee representing the journeymen's organizations and the Department of Education has been established to offer suggestions and aid in the solution of problems arising from time to time.

Building Construction in October showed a surprising increase, according to figures compiled by the F. W. Dodge Corporation. The increase in 36 Eastern states was 25% as compared with a normal increase of 7%. Contracts awarded in those States amounted to $360,687,000. The largest increases were in New York State and New Jersey and in residential building. Total construction started in the first ten months of 1923 has amounted to $2,947,787,000, an increase of 2% over the corresponding period last year.

New York Business Publishers, Inc., has elected Edwin A. Scott, editor of the *Sheet Metal Worker,* president for the ensuing year. Mr. Scott has also been made treasurer and a member of the executive committee of the Associated Business Papers, Inc.

James A. Donnelly, Donnelly Systems Co., New York City, discussed "A New Method of Temperature Regulation for Steam Heating Apparatus" at a recent meeting of the Brooklyn Engineers Club in Brooklyn, N. Y.

Merchants Association of New York has issued the 1923 Year Book covering the work done during the year ending May 1, 1923. The publication comprising 394 pages and includes an alphabetical list of the 8,000 members, together with an index.

New York.—Big business will have at least 200,000 new positions of responsibility by 1930 whereas there are available in the technical schools of the country today only about 50,000 students, a committee of educators and industrialists, organized by the National Industrial Conference Board, has found. The committee met recently in New York City to consider the problem and consider ways and means for overcoming the educational deficiencies of the country.

Copper and Brass Research Association, which held its annual meeting in New York, November 15, announced that the program for 1924 provides for an extension of the association's activities, in line with plans to develop new and increasing outlets for brass and copper. Copper consumption for the first three-quarters of 1923, it was reported, was greater than the consumption for the entire year of 1922. The consumption of this metal in the United States at the present time is about 70% of the world's production.

National Association of Master Plumbers will hold its next annual convention in West Baden, Ind., June 24, 25 and 26, 1924. This decision was made at a recent meeting of the board of directors in Evansville, Ind.

Manufacturers Notes

B. F. Sturtevant Co., Hyde Park, Boston, Mass., announces that the Philadelphia Division of the B. F. Sturtevant Company is now located in Camden, N. J., at Thorne and Copewood Streets (near White Horse Pipe and Haddon Avenue). A modern daylight building has been secured at this location, with Pennsylvania Railroad siding. Here, it is stated, an up-to-date shop will be maintained for manufacturing all kinds of sheet-metal work required for the complete installation of fan systems, including heating, ventilating, drying, exhaust and conveying work. The new shop will give this division four times its previous capacity.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports that the Paul Revere and Moses Cleveland Schools, in Cleveland, O., are being equipped with modern power plants which will include two Westinghouse new model Roney stokers. These new stokers will be driven by American Blower Company steam engines, controlled by regulators. Either Ohio run-of-mine or slack coal of approximately 12,000 B. T. U. will be used in the 169 H.P. horizontal-tubular boilers installed in these buildings.

Minneapolis Heat Regulator Co., Minneapolis, Minn., is increasing its production capacity 70% by enlargements to its plant and the installation of new equipment. An increase of 40% in the factory space will be provided by the additions.

L. J. Mueller Furnace Co., Milwaukee, Wis., has opened a branch office in the West-

PUBLIC SCHOOL No. 62, BRONX, New York City, N. Y.
Over one Hundred Lehigh Fans are installed in New York City Schools
Engineers—New York Board of Education.
Contractors—Federal Heating Co., New York City

LEHIGH MULTIBLADE FANS

FOR HEATING AND VENTILATING

WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

HERSH BROTHERS CO.

654 Mill Street **ALLENTOWN, PA.**

George B. Post and Sons
Architects

Meyer, Strong and Jones
Consulting Engineers

Thompson-Starrett Company
Contractors

Courtesy of "American Architect"

THE ROOSEVELT HOTEL

¶ Here, again, Sturtevant Heating and Ventilating engineers worked closely with the architects and engineers.

¶ The silentvane fans, which have been specified, are the finest air-supply and exhaust units obtainable. There are twenty-three fans which will deliver 40,746,000 C.F. per hour.

¶ Remember—Sturtevant engineering coöperation is at your service through a national organization with a background of sixty years' experience.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Sales Engineering Offices:
Atlanta, Ga.
Boston, Mass.
Buffalo, N. Y.
Camden, N. J.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Detroit, Mich.
Hartford, Conn.
Indianapolis, Ind.
Los Angeles, Cal.
Minneapolis, Minn.

Plants Located in
Hyde Park, Mass.
Sturtevant, Wis.
Berkeley, Cal.
Framingham, Mass.
Camden, N. J.
Galt, Ontario

Sturtevant
PUTS AIR TO WORK

Sales Engineering Offices:
Montreal, P. Q.
New York, N. Y.
Pittsburgh, Pa.
Portland, Ore.
Rochester, N. Y.
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Springfield, Mass.
Toronto, Ont.
Washington, D. C.

788

ern Moline Plow Co. building in Salt Lake City, Utah. N. D. McCutcheon is in charge of the offices and of the western distributing warehouse, also located here.

O-E Specialty Manufacturing Co., Milwaukee, Wis., has announced that in future all of its catalogs, price lists and advertising data will conform to the standard size specified by the National Trade Extension Bureau.

Monitor Boiler Co., Philadelphia, Pa., has removed its offices from the Finance Building to the Schaff Building, 1505 Race Street.

American Radiator Co., Buffalo, N. Y. has appointed the A. H. Wolff Gas Radiator Co., New York City, as sole distributor for its new gas-burning boiler for steam and water heating systems, hot water supply and industrial heating. The Wolff Company will handle also all gas-fired products manufactured by the American Radiator Company.

National Tube Co., Pittsburgh, Pa., has announced plans for the erection of a laboratory in that city to conduct chemical and physical research in an effort to improve the material process and manufacture of pipe.

Grinnell Co., San Francisco, Calif., is constructing a new building at Fifth and Brannan streets, San Francisco, at a cost of approximately $80,000.

Triumph Electric Heating Corporation, Los Angeles, Calif., is the new name of the Triumph Electric Radiator Co., formerly of San Francisco. The new company has a factory at 1614 South Flower Street, Los Angeles. It has a capital of $500,000. The officers are: president, A. M. McLennan; vice-president and general manager, Arthur Hess; and secretary and treasurer, Charles McKinnis, Wallace, Idaho.

Excelso Specialty Works, Inc., Buffalo, N. Y. has purchased the Phaeton Heater Company, Peekskill, N. Y. and will continue to manufacture Phaeton heaters with the single change of the name, which in the future will be the Excelso Phaeton heater. The company announces it will be ready to distribute the Phaeton heaters in all sizes soon after the first of the year.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. has established a general engineering division at its South Philadelphia plant to study central station and industrial plant problems, involving application of steam power apparatus, such as steam turbines, condensers and reduction gears.

U. T. Hungerford Brass & Copper Co., Boston, Mass., has removed to 411-429 D Street where it has 45,000 sq. ft. of floor space. Other improvements at the new location include a covered shipping platform that will accommodate five trucks at one time, overhead trolleys, electric hoists and other labor-saving devices to facilitate loading trucks.

Rider-Ericsson Engine Corporation and Delamater Iron Works announce the election of Harry Meachem, formerly of Dean Brothers, Indianapolis, Ind., as vice-president and general manager.

Wm. H. Page Boiler Co., New York, has moved its general offices to 58 West 40th Street, New York, where the company occupies the entire eighth floor at the new address. The offices are near Fifth Avenue and overlook Bryant Park.

J. H. Williams & Co., whose general offices were until recently in Brooklyn, N. Y., has moved to Buffalo. The company will maintain a Brooklyn sales department, with warehouse and shipping facilities.

Monitor Bi-Loop Radiator Co., Lansdale, Pa., has been formed to take over the business of the old Monitor Bi-Loop Radiator Co., of Delaware, which has been in the hands of a receiver. The new company has repaired and remodeled the plant and is running full time in both boiler and radiator departments. The company has recently developed a steel house-heating boiler which is being manufactured at the Lancaster plant. The officers of the new company are: President, William C. Bidlack; vice-president and general manager, F. J. Vaux; secretary and treasurer, E. Derendinger.

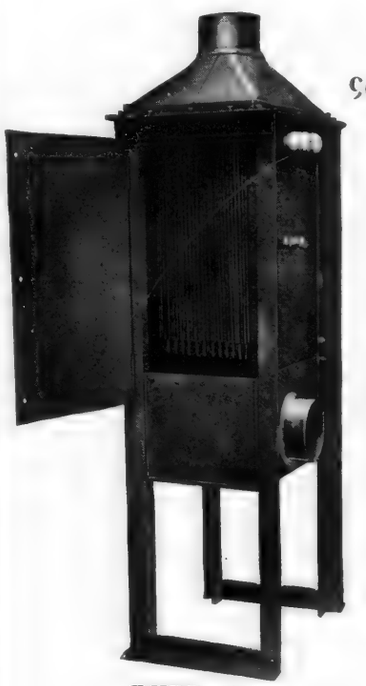
Central Station Heating Notes

Schuylkill Haven, Pa.—Voters of this city at a recent election decided to retain the municipal heating plant.

Winnipeg, Manitoba.—The Winnipeg

OZONAIR LIMITED

96, VICTORIA STREET, WESTMINSTER, LONDON, S.W 1.



TYPE 68

For large Ventilation and Deodorization Plants.

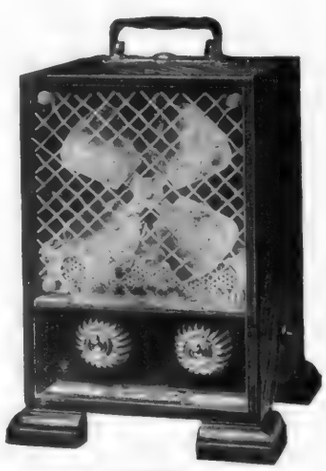
PIONEERS (since 1905) in the manufacture of apparatus for all the technical and commercial applications of OZONE.

Apparatus made under OZONAIR patents and designs give the highest yield of absolutely pure OZONE.

The construction is based on the most simple yet soundest principles so that upkeep is so small, as to be negligible.

The Company are desirous of negotiating with a substantial American Firm for the purpose of arranging sole manufacturing rights.

CORRESPONDENCE IS INVITED



TYPE 32

Portable apparatus for Rooms, Offices, etc.,

And in the Y. M. C. A. at Zanesville ——

When the Zanesville, Ohio, Y. M. C. A. was built three years ago, Heatovent solved the ventilation problem.

A Y. M. C. A. building is one in which large parts of the building will be idle over daily periods of time. Ventilation will not be necessary continuously as in many other types of buildings, and the centralized ventilating system is for this reason unsuitable.

With Heatovent it is possible to ventilate as much or as little of any building as desired or required. A touch on the little white button starts the measured flow of warm air in any room; a touch on another button stops it. Thus rooms, halls and dormitories are ventilated independently as desired.

And Heatovent is serviceable. The Zanesville Y. M. C. A. possesses a ventilating system which could be moved, in whole or in part, to any other structure should that become desirable. The salvage value of Heatovent is almost one hundred percent.

Heatovent will solve your ventilating problems. It provides fresh air warmed to just the right temperature in just the right volume. It is flexible, serviceable, simple and economical. Let our engineers call to consult with you.

THE BUCKEYE BLOWER COMPANY

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372 Whitehall Street, Atlanta, Ga.

324 Monadnock Block, Chicago, Ill.
503 Wabash Bldg., Pittsburgh, Pa.

1400 Broadway, New York City.
302 Delmain Bldg., Kansas City, Mo.

city council is to submit to the voters a proposed by-law providing for a $875,000 civic central heating plant.

Denton, Texas.—Work has been completed on the new $110,000 central heating plant for the College of Industrial Arts.

New Incorporations

Hi-Lo Products Co., Monadnock Block, Chicago, Ill., capital $100,000, to manufacture and deal in motor, air current and ventilating fans. Incorporators: F. M. Schieble, Windham Phinny, P. J. Maguire. Correspondent, P. J. Maguire, 29 South La Salle Street, Chicago.

Percoplate Boiler Sales Co., Newark, N. J., capital $100,000, to manufacture the Percoplate boiler and other heating apparatus. Secretary, H. B. Mead, 111 Gotthart Street.

Oil-O-Matic Heating Corporation, Norfolk, Va., capital $10,000 to manufacture heating specialties. Officers: C. C. Carper, president and F. B. Carper, secretary.

Waltham Oil Burner Co., Waltham, Mass., capital $50,000 to manufacture oil-burning equipment. Incorporators: Frank H. Burrill, Warren H. Dumbrack, and Norman K. Dumbrack.

Oil Heating Equipment Co., Boston, Mass., capital $25,000. Incorporators: Howard E. Sill, J. Parker, B. Fiske of Auburndale, Mass., and Hewitt G. Fletcher, Boston.

Johnson Fuel Oil Burner Co., Bridgeport, Conn., capital $50,000. Incorporators: R. D. Campbell, N. M. Campbell and John D. Slady.

Jordon & Co., Chicago, Ill., capital $5,000 to engage in general heating and plumbing contracting business. Incorporators: Milo E. Jordon, J. N. Lee and W. B. Potter. Correspondent, Frisch & Frisch, 6 N. Clark St., Chicago.

Contracts Awarded

Workman Plumbing Co., Parsons, Kan., heating, ventilating and plumbing Shrine Mosque, in Pittsburg, Kan., for $42,000.

A. Brizard, Inc., Arcata, Cal., heating plant for the Arcata Union High School group, for $11,000. The system will be low-pressure steam. The present system is hot water. The same piping and radiators in the main building will be used by substituting another type of valve. The Pacific boiler to be installed will be equipped to burn fuel-oil, a 60 ft. smokestack being arranged for, together with an underground oil tank of 200-gal. capacity. In addition to the main building, the system will heat a manual training building, and the new gymnasium. Concrete conduits will be used to carry the pipes to the different buildings.

Hall Sheet Metal Works, Chico, Calif., gas-fired heating system for the Presbyterian church in Chico, for $3,000.

Carstens Brothers, Ackley, Ia., heating, ventilating and regulating Linn County court house at Cedar Rapids, Ia., for $49,784.

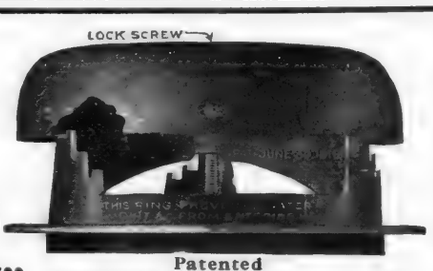
Death of Charles P. Steinmetz

The death of Dr. Charles Proteus Steinmetz at his home in Schenectady, N. Y. October 26, came as a profound shock to the public which had followed his many accomplishments in the electrical world, and particularly so to members of the engineering and scientific professions.

Born in Germany, Dr. Steinmetz came to America in 1889 practically penniless. He found a position with the Osterheld & Eichemeyer Manufacturing Co., first as a draftsman, then as electrical engineer and finally on research work in the company's laboratory. With the absorption of that company by the General Electric Co., he was attached to the latter's calculating department and eventually took charge of the research work.

His most noteworthy accomplishments were in the development of electrical theory and its practical application to the every day problems of life. His book "Theory and Calculation of Alternating Current Phenomena" particularly revealed a new field and pointed the way to many new inventions. He was honored by election to high position in scores of scientific organizations and at different times held also professorships at several universities.

At the time of his death he was chief consulting engineer of the General Electric Company. While the immediate cause of death was heart failure, it was caused indirectly by overexertion in his work and the effects of a recent trip to the west.



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Patented

"NOTCH" MUSHROOM AIR DIFFUSER

is conceded by architects and engineers to be the most practical and satisfactory air diffuser made.

Made of Cast Iron from 4" to 10" in diameter. Easily adjusted in recessed notches which cannot slip. Lugs for either wood or concrete floor anchorage.

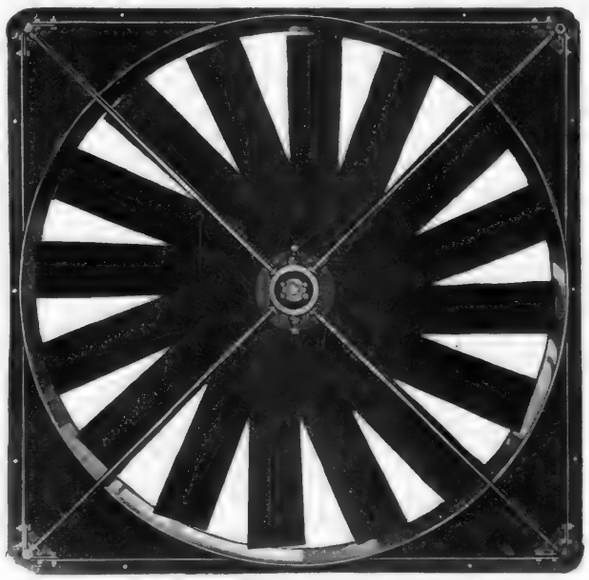
These have been installed in theatres, school auditoriums, moving picture houses, court rooms, churches and lodge rooms in every state in the United States, as well as in Canada and abroad.

Besides the NOTCH type, we manufacture several other styles of air diffusers: the CAMEL-BACK, the AISLE HOOD and others. This enables us to meet the particular requirement of your building. Have you a set of blueprints of these models? Your name on a letterhead will bring them.

KNOWLES MUSHROOM VENTILATOR CO.
202 Franklin Street New York

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place
NEWARK NEW JERSEY

PROPELLER TYPE FANS



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Kansas City, Mo.

THIS BUILDING IS VENTILATED
By
SERI-VANE FANS

For heating and ventilating equipment from the simplest to the most complex, write

THE NEW YORK BLOWER COMPANY
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Factory: LaPorte, Indiana. **Branch offices in principal cities.**

Our engineers are prepared to give expert advice on cooling, evaporating and conveying systems

WRITE FOR CATALOGS

How The Heating Contractors Propose To Solve The Apprenticeship Problem

Details of the plan presented to the Heating and Piping Contractors' National Association for meeting the need for more apprentices are given in the full report of the Committee on Apprentices, which was published in the association's *Official Bulletin.*

After noting the fact that "there exists a dearth of skilled craftsmen," the committee quotes from the resolution adopted by the association last year in Buffalo, providing for "the formulation of a definite plan for the employment and training of apprentices."

The committee was unanimous in the opinion that the need of skilled mechanics is really urgent and that it was, therefore, imperative that the association should take immediate steps to put into operation some plan for the adequate training of young men.

The committee then presented the following conclusions and recommendations:

THE COMMITTEE'S RECOMMENDATIONS

1. The committee unanimously agreed that the work of steam fitting and other piping requires a helper for every journeyman.

2. From this large number of helpers, there should be selected a certain number who are particularly fitted as to education, mechanical inclination, physical ability and habits to become capable and efficient journeymen; the number to be such as the trade can properly absorb, and to be arrived at after study in each locality. These young men are to be distinguished from the other helpers by the name, "certified steamfitters' helpers." The committee felt that "the name apprentice is not appropriate as a designation, as it signifies a relation, by indenture, to an employer for a considerable period of time at little or no remuneration, while learning a trade. This idea is obsolete and not at all the aim of the employer in this industry."

3. The committee felt that the carrying out of any program should be left to the local associations, where such exist, or to the individual, where such locals do not exist.

4. The program should be to educate men as mechanics and not as engineers.

For the purpose of putting the plan into practical and immediate operation, the committee recommended the adoption of the following general program of procedure which, it was believed, with slight modifications, would adapt itself to shops of any size, operating under any local labor conditions which might exist. This program was adopted by the association.

OUTLINE OF GENERAL PROGRAM COMMITTEE

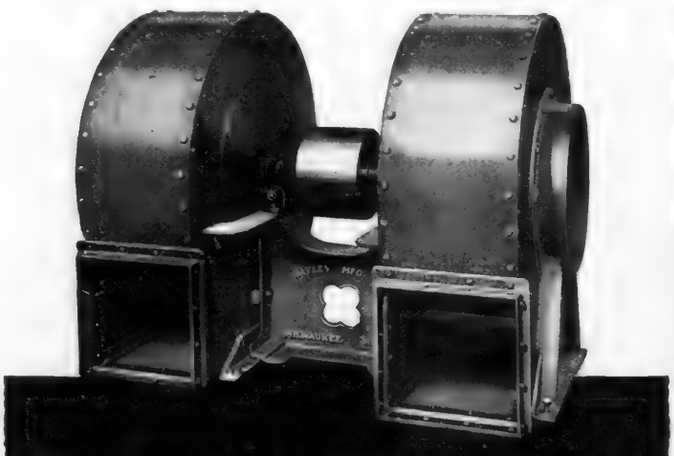
For the furtherance of the operation of this program, it will be necessary, in each locality, to have a committee appointed, same to be made up essentially as follows: Three members to be selected from the employers, three from the journeymen and one from the educational board, whose joint duty it shall be to see to it that the provisions of the program, which they may agree upon as being adaptable and workable in any given locality, are faithfully carried out.

Eligibility—In the matter of eligibility two types of young men must be considered: First, the young man who already is engaged in learning the trade, who in all probability, due to the practical experience which he has had, shall at once be entitled to become a "Certified Steamfitter's Helper" of advanced standing. Second, any boy not less than sixteen years of age, preferably an American, who has had a grammar school education, is mechanically inclined and who possesses a reputation for honesty and good deportment and is physically able to undertake the work may be regarded as eligible to become a "Certified Steamfitter's Helper."

Application and Registration—The qualifications, covering eligibility, can best be brought out by the adoption of a standardized application blank which shall be furnished by the local association or individual to the applicant, who shall fill out same and file with the local committee which committee takes the responsibility for seeing that the young men accepted as eligible shall meet the required standards.

After applications have been accepted by the committee, they are to be registered and the committee then becomes responsible for seeing that they receive an opportunity to secure the proper kind of shop and educational training.

Probation—All beginners, who are accepted by the committee as eligible, should be taken



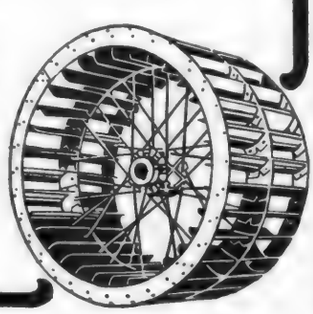
Economical Ventilation

Next to efficiency, economical operation and durability are the most important requirements of any mechanical ventilation system.

Bayley

Plexiform Fans

meet all of these requirements and are in addition designed to occupy a minimum of space. Light, yet sturdy and durable, easy running, moving the greatest volume of air with low power and upkeep costs are a few Bayley Plexiform features. Made in various sizes, either single or double mounts, with outlets in any desired position, for engine motor or line-shaft drive.



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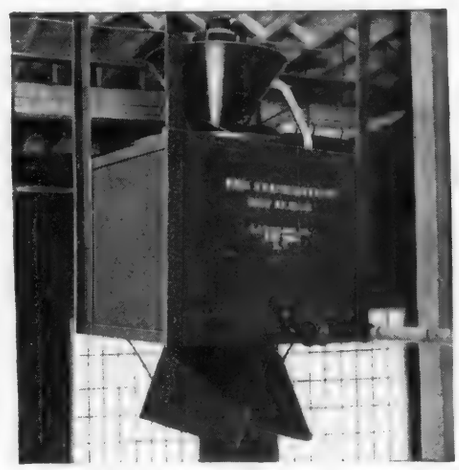
BAYLEY MFG. CO. DEPT. E
Milwaukee, Wisconsin.



High Ceiling Type Wing Featherweight Unit Heater. Supported from roof or ceiling beams by eight small bolts. Quickly installed without alterations or extensive piping.

Wing Heaters Overcome All Objections To Most Unit Systems

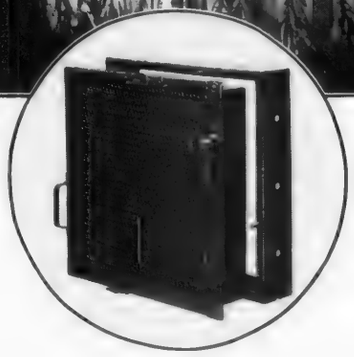
They go overhead out of the way and save valuable floor space for other uses. At all times there is an active circulation of air, free from dangerous drafts and hot spots. Send for your copy of our Heater bulletin containing interesting data and specifications on Wing Featherweight Unit Heaters.

L. J. Wing Mfg. Co.

Fans and Blowers *Damper Regulators*
Unit Heaters *Small Turbines*

Hudson & 13th Sts., New York

REED AIR IS CLEAN AIR



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If your school buildings were situated alone on a top of a mountain you would be sure the children would breathe clean air. Of course, that is not practical, but you can bring air as clean as mountain air into the schoolrooms in the most congested district.

Reed "all metal" air filters (patented) are guaranteed to remove 97% of dust, soot, carbon particles and air borne bacteria. Lowest in first cost—first cost is last cost. Reed "all metal" air filters will save their cost by eliminating 75% of re-decorating expense. They check epidemic spread.

Reed Air Filters "all metal" are sold on a "Try Before You Buy" plan. For the children's sake investigate Reed Air. Send coupon for the book "Are you interested in clean air?"

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Our nearest representative will be glad to make the authoritative E. Vernon Hill Test on your air conditions. No obligations.

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Gentlemen: Please send me without obligation your informative folder, "Are You Interested in Clean Air?"

Application.....C.F.M.

.....

Name.....

Address.....

Reed Air

TRADE MARK

filters ALL METAL

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under a probationary period of six months to afford them an opportunity to give evidence that they have sufficient ability to warrant their continuation of the course.

Provision should also be made so that any time during this probationary period that satisfactory evidence is submitted to the committee that the applicant does not meet the minimum requirements called for, he may be dropped from the roll of registered "Certified Steamfitters' Helpers."

Agreement—In order to avoid misunderstandings and to clearly define the obligations of both the employer and the employee, a form of agreement should be drawn up by the committee, and signed by both parties. In the case of beginners, the instrument should also be signed by the young man's parent or guardian.

Advanced Standing—At the discretion of the committee advanced standing may be granted: First: To those young men who have already spent some time in learning this trade. Second: To beginners, who can furnish satisfactory proof of graduation from any vocational, high or technical school or of having had other experience or training which in the opinion of the committee entitles them to such consideration.

Wages—On account of the varying wage scale in different parts of the country, it is impossible to set up any standard wage for "Certified Steamfitters' Helpers" and we believe that same should be left to the local committees to determine and fix such wage. However, we desire to emphasize our opinion that the minimum wage for beginners should be made sufficiently attractive as to induce the right kind of young men to enter this industry.

In many instances this wage has been made a percentage of a journeyman's wages increasing as the period of training progresses, but this committee is of the opinion that in some instances this percentage is not enough to accomplish the aims which this industry has in view.

As a committee we recommend that each local committee take a liberal view when determining the wages of beginners.

Period of Service—In determining the necessary period of service, the local committee should recognize that same will vary according to the development of the individual and that fundamentally the question is what the man knows rather than how long it takes him to acquire this knowledge.

Our belief is that the real requirement should be a standard of practical and technical knowledge of all departments of this trade which will ensure that the young man shall be fully equipped to practice his trade in a manner creditable both to himself and this industry.

To acquire this standard of knowledge we believe that the minimum time requirement should be set at four years of approximately 2,000 hours each, with advanced standing allowed, as provided for under that heading.

While the division of this time should be left to the local committee, it has been found that eight periods of approximately 1,000 hours each has in many instances been accepted as a reasonable division.

Provision should be made, so that all lost time shall be made up before starting the work of the next period.

Interchange of Helpers—It shall be the duty of the committee to provide adequate opportunity for these young men to develop to their full capacity and to facilitate same, arrangements should be made so that transfers may be made from one shop to another so that they may become familiar with the various kinds of work, it being recognized that the character of the work in some shops is not sufficiently varied.

Right of Appeal—Provision should be made, so that in case any question of disagreement arises between the employer and employee, it shall be the privilege of either to appeal to the local committee for a hearing and the finding of the committee, on the facts, should be acceptable to both parties.

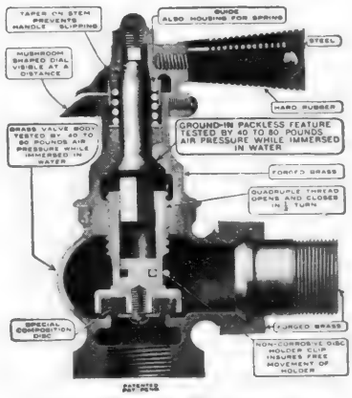
Termination of Agreement—Provision should be made, so that the agreement between the employer and employee may be terminated or suspended for any reason which seems to the local committee to be justifiable and that resumption of the agreement may be effected in the same manner.

It should, however, be understood that no young man shall leave his employer or change employers before his agreement expires, without the sanction of the local committee.

Supervision—This committee believes that a standardized job or process form should be gotten out, setting forth the essential jobs or processes to be learned during each of the eight periods.

It must be made clear to the young man that he must complete each process listed,

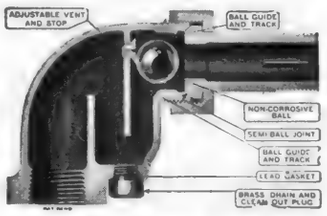
THE O-E 3 IN 1 HEATING SPECIALTIES


TAPER ON STEM PREVENTS HANDLE SLIPPING
GUIDE ALSO HOUSING FOR SPRING
STEEL
MUSHROOM SHAPED DIAL VISIBLE AT A DISTANCE
HARD RUBBER
BRASS VALVE BODY TESTED BY 40 TO 80 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
GROUND-IN PACKLESS FEATURE TESTED BY 40 TO 80 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
FORGED BRASS
QUADRUPLE THREAD OPENS AND CLOSES IN ¼ TURN
SPECIAL COMPOSITION DISC
FORGED BRASS
NON-CORROSIVE DISC HOLDER CLIP INSURES FREE MOVEMENT OF HOLDER

"O-E" Improved Perfect Packless Graduated Valve.

MERIT INVESTIGATION

TRADE O-E MARK

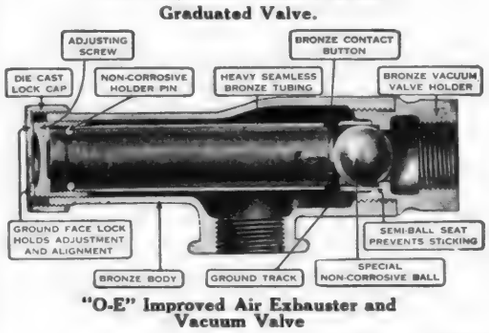


"O-E" Perfector Ball-Check Water Seal Union Elbow with Adjustable Air Vent

Three Systems In One

Vapor, part of the time.
Vacuum, most of the time.
Pressure, when wanted.

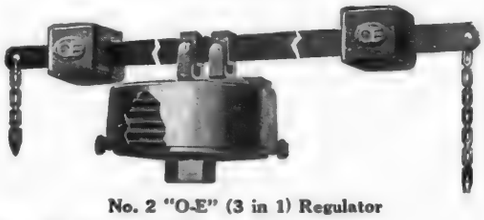
Eliminates floats, pumps, return traps, diaphragms, etc.



"O-E" Improved Air Exhauster and Vacuum Valve

There are thousands of buildings of every description satisfactorily O-E Heated.

Send for Catalog "A."



No. 2 "O-E" (3 in 1) Regulator

O-E Specialty Mfg. Co., 12 Keefe Ave., Milwaukee

Facts Regarding Clean Air

You are probably somewhat familiar with the results that can be obtained with a semi-dry type of air filter in which the cleaning of the air is accomplished through the impigning of dust particles against a viscose coated surface.

Have you given serious thought to the factors affecting the proper design of this type of air filter?

The resistance of the filter when new or clean is not important compared with the resistance after the filter has caught a reasonable amount of dust.

The quantity of air that can be passed through a new or clean filter is of slight importance. Can the rated quantity of air be forced or drawn through a dirty filter without unduly increasing the resistance?

Has the filter the ability to collect dust throughout its depth? This is the only way in which it can hold a large quantity of dust and make it unnecessary to clean it frequently.

Is the filter medium constructed and arranged in the filter cell in a positive manner so as to assure an even air flow, equal distribution of dust and the same efficiency over the whole area of the filter? Have you positive assurance that all filter cells are exactly alike, both in efficiency and resistance? Will an individual cell, after being washed not once but many times always come back to its original resistance?

Can the washing of the cell be accomplished quickly and without any great strain or effort on the part of the one doing the washing?

Midwest Air Filters answer all of these essential questions satisfactorily. Every factor that contributes to efficient and successful service has been thoroughly analyzed and embodied in its design and construction. No essential points have been sacrificed at the expense of others.

The result is a filter well-balanced in every way, in which the human element is not a factor at all.

On every ventilation job, whether for schools, theatres, hospitals, public buildings, etc., you will find that the Midwest Air Filter will give you permanently dependable service. A copy of our Filter Data Book should be in your files. Just ask Department F-4 to send you a copy.

Some attractive sales territories are still open. Write us for details.

Midwest Canada Ltd.
83 Craig St. West
Montreal, Canada

MIDWEST AIR FILTERS

INCORPORATED
100 EAST 45TH STREET
NEW YORK CITY

Midwest Airfilter Pacific, Inc.
953 Monadnock Building
San Francisco, California

either in a trade subject or any related subject (such as mechanical drawing) in each period, to the satisfaction of his employer or instructor, before commencing the work of the succeeding period.

In his practical work the young man should be under the supervision of the employer, either directly or through his journeymen and it should be the employers' and journeymen's duty and obligation to take a personal interest in the training and development of these young men; the purchase of technical books, distribution of trade papers and a show of interest in the boy's skill and in his home life all aid and encourage him.

As the young man must necessarily spend a great deal of his time under the direct supervision of the journeymen, the employer should use discretion in his selection of men to whom he intrusts the training of the boy for there is no denying the fact that while some journeymen are very efficient themselves they lack the capacity for teaching others.

Establishing Schools—As the public schools in most of the larger cities and in many of the smaller cities are designed and equipped to give these young men the necessary technical instruction, it should be the purpose of the local committee to make arrangements with the head of the public school system, whereby such instruction may be given; it has been found that, as a rule, vocational directors are glad to co-operate to the full extent of their ability.

We have to suggest that the local committee first get in touch with the superintendent, who will, no doubt, refer it to the local vocational director; where this is impossible, get in communication with the State Supervisor of Industrial Education whose name can be obtained through the State Department of Education.

Usually, all that is needed to gain the co-operation of the local vocational director, is an active local interest on the part of the local committee in the object which they wish to attain.

Where such co-operation cannot be secured, the local committee should use such other facilities as may exist.

In some cases it may even be necessary for the local committee to establish their own schools with instructors of their own choice. We believe, however, that it will be seldom necessary to do this.

Suggested Program for School Work—It is the sense of this committee that classes should be held in the evening and we therefore recommend that not less than one evening a week (two hours each evening) be devoted to trade subjects or supplementary work. We again wish to emphasize, in this connection, that the object is the creation of skilled mechanics and not skilled engineers.

Suggested Courses of Study—Owing to the varied working conditions, we believe that this committee should not attempt to prescribe a definite program for study. It should, however, be the aim of the local committee to establish a course embodying certain fundamentals which may be universally applied and which must be pursued, in order that the young man may qualify for his diploma.

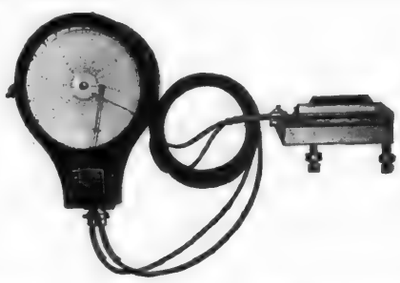
In addition to the fundamental and related subjects (such as mechanical drawing) this committee believes that a certain amount of instruction should be given in economics, setting forth the history of economic development also that some instruction should be given in the fundamentals of industrial organization.

A limited course in civics covering the fundamentals of government and law and the citizen's duty to his country would also tend to make the young men broader minded and better citizens.

Summary—This committee wishes to point out to all local committees that it is their firm conviction that in order to formulate a successful plan for accomplishing the results sought, there are a number of very pertinent features which must always be borne in mind. Foremost amongst them is the securing of the right kind of boys by making the industry of heating sprinkler and other pipe fitting really attractive to them.

To assist in accomplishing this, the local committees should make use of intensive propaganda of all kinds, should bring all interests involved and should by lectures, advertising, pamphlets and personal contact with the workers point out the real opportunities which are open to the young men who enter this industry.

Employers must lose sight of any immediate benefits to be derived from the operation of any plan adopted and try to comprehend the broader idea of building for the future.



RELATIVE HUMIDITY

Perhaps you may have the very best humidifying equipment. But, how do you know it is always functioning correctly unless you have some means of checking the accuracy? The answer is--

TRADE MARK
BRISTOL'S
REG. U.S. PAT. OFFICE

Recording Wet and Dry Bulb Thermometer

With this equipment you can know the relative humidity for any hour of the day or night. The initial expense is not big and the maintenance almost nothing.

Bulletin N-311 devoted exclusively to Bristol's Humidity Recorders. Shall we send you a copy?

THE BRISTOL COMPANY
WATERBURY, CONN.

Boston New York Philadelphia Pittsburgh Detroit
Chicago St. Louis San Francisco

I Want Several Sales Engineers

I am the President and General Manager of one of the fastest growing businesses in the country and need some good heating and ventilating sales engineers.

I have twenty six salesmen, some of whom are making from $6,000 to $12,000 per year, net, for themselves. Others are doing reasonably well, but could do better and a few of them are failures.

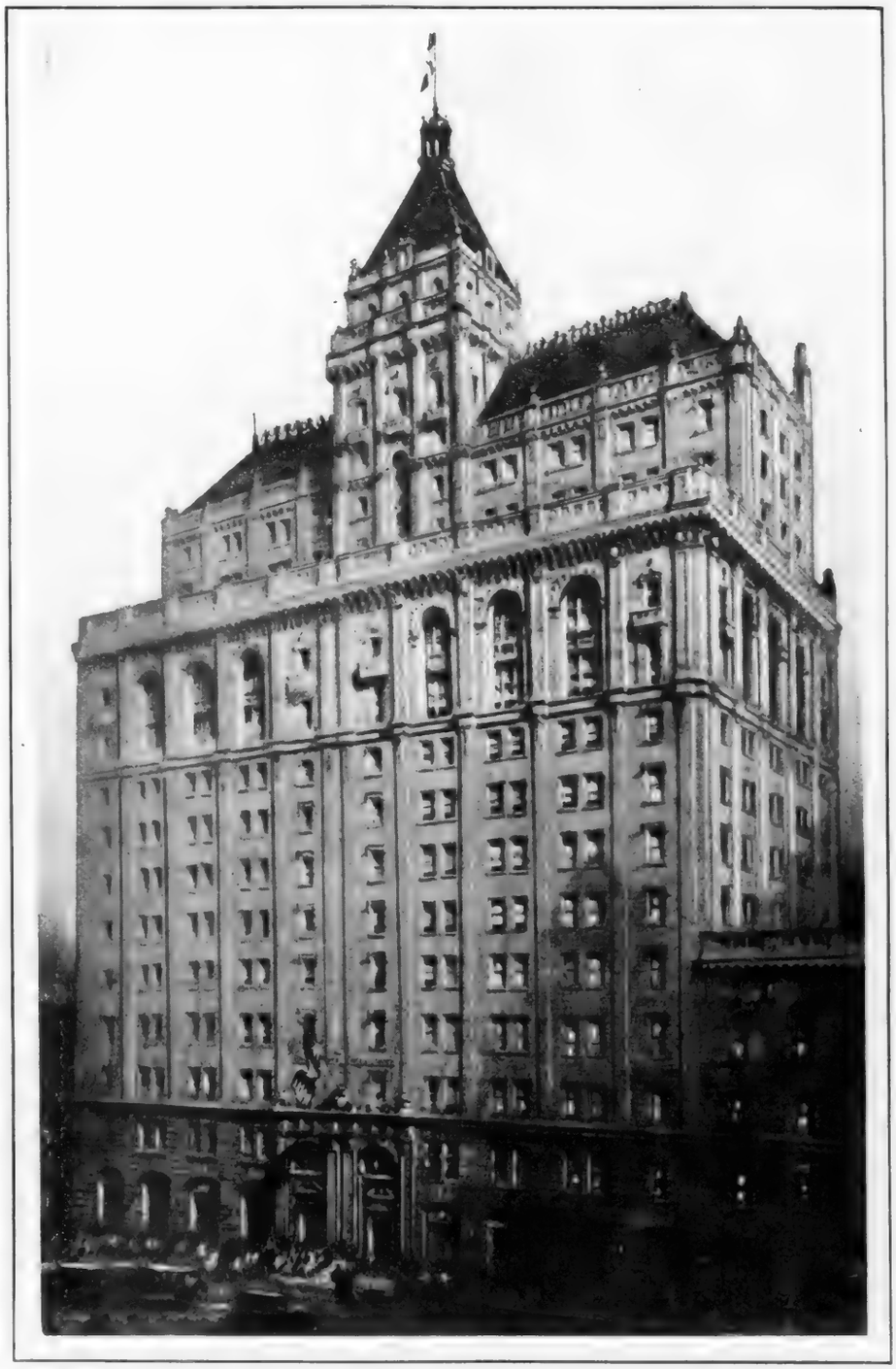
I want to add several good men and put them in good territories where we are not represented and I also want to replace some of my "dead ones."

I want to be frank in stating that I am very rigid and perhaps severe in my selection of sales engineers, but if you can stand my test, you can make good money.

If you are not a good salesmen, or if you don't know heating and ventilating, don't bother to write me. I want live wires,—real men—who appreciate that they themselves must work and have ability to make a success. Men who are qualified to call on architects, public boards, owners, etc. and cannot only sell, but really serve this company and its clients. I am willing to pay the price to get such men.

I have a cooperative commission arrangement whereby you will profit in proportion to the work you do, but I will guarantee a substantial salary and all expenses, to the right man.

If you are progressive and interested, write and tell me all about yourself, your age, experience, education, etc., and what territory you would like to work in. Address Box 123 care Heating and Ventilating Magazine.



Ludlow & Peabody
Architects

New York Times Annex
New York City

R. D. Kimball Co.
Engineers

Murrell Eng. Corp., Heating Contractors

We are justly proud of the fact, that when the New York Times, the leader in the field of journalism, recognized the need for ventilating equipment in its new home, the UNIVERSAL UNIT was selected to meet that requirement.

The UNIVERSAL UNIT is universally acknowledged the leader of Unit Ventilating Equipment by Architects and Engineers, for its accomplishment, quality of workmanship, exclusive features, and for the service that is part of every UNIVERSAL UNIT Installation.

THE UNIVERSAL UNIT HEATING AND VENTILATING SYSTEM
The standard by which all other makes are measured

Manufactured by

JOHN J. NESBITT, INC.

48 E. 41st St., New York City — Atlantic City, New Jersey

Journeymen steamfitters must be converted to the idea that the future of their trade requires for its advancement and continuance, their whole-hearted co-operation and support of the plan.

They should be shown that the present number of helpers becoming journeymen each year is not at all sufficient to supply the demand; that if a shortage of efficient journeymen becomes acute, it will be necessary to use whatever labor is available, which will mean that there will come into the trade a large number of semi-skilled workers which later on are likely to become competitors of every properly trained mechanic.

They should be brought to realize that a large surplus of workmen would be just as injurious to the employer as to the journeymen because all those who are unemployed would naturally endeavor to find a market for their labor and the ultimate result would be the opening of a number of "one-man shops."

They must be convinced that by requiring a certain standard of skill and knowledge on the part of young men practicing this trade, the trade is elevated and that if at any time the number seems to be greater than there is room for, the matter can be regulated by the local committee of which they are a component part.

Journeymen should also be advised that if the present conditions are permitted to continue and no immediate provision is made for the future, the work now being done by journeymen steamfitters is likely to be absorbed by some other class of mechanics and the trade as a whole faces the possibility of being wiped out.

Educators should realize that the school work may be greatly overdone and that in planning their courses great care should be exercised to avoid the introduction and pursuit of studies which however desirable they may be are not really required by men fitting themselves to do the work expected of journeymen steamfitters.

The Committee on Apprentices, which submitted the foregoing report, was made up of William H. Oakes, chairman; Walter Klie, W. A. Pope and J. E. Rutzler.

New Firms

Frank H. Schubert and William G. Christy have organized the Schubert-Christy Construction Machinery Co., and opened offices in the Railway Exchange Building, St. Louis, Mo. The firm will represent manufacturers of power plant equipment and render general construction engineering service, specializing in the design and construction of water cooling equipment for refrigerating and power plants. Mr. Schubert has been district manager of the Wheeler Condenser & Engineering Co., and Mr. Christy, secretary of the St. Louis Section, American Society of Mechanical Engineers. The latter formerly was with the St. Louis Boat & Engineering Co.

American Construction Council on Building

The American Construction Council has made remarkable progress during the past year, Franklin D. Roosevelt, its president, stated recently, following a meeting of the council in New York.

Mr. Roosevelt announced that the council had decided upon a very definite program, including organization of building congresses in various communities throughout the United States and the rendering of substantial aid in securing apprentices in certain of the building trades.

Recalling the aid which the council rendered last spring during a national crisis in the building industry, Mr. Roosevelt stated that his organization now urged that all maintenance, repairs and alterations possible be accomplished during the winter months and that caution be exercised in planning for construction work next year in order to prevent a possible abnormal demand for materials and labor.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

FOR SALE—1 Sturtevant plate fan 100-in. RHTH, direct-connected, 5 x 8 Sturtevant engine; 1 Sturtevant plate fan, 140-in. RHTH; 1 propeller wall fan, diam. 49 in., Howard & Morse; 2 No. 5 Serivane multiblade fans, New York Blower Co., RHTH; 2 No. 5 Serivane multiblade fans, LHVU Eastman Kodak Co., Rochester, N. Y.

ENGINEER WANTED—Heating and ventilating engineer for a well-established concern in Cleveland. Must be experienced and able to properly estimate and close contracts. A fine opportunity for one who can qualify and who can furnish A1 references. Address Box 111, care of Heating and Ventilating Magazine.

AGENCIES WANTED—Two live wire English speaking Canadians (both know French as well) with good connection in Eastern Canada can handle a few additional Plumbing, Heating or allied lines. What offers? Address Box 121 care Heating and Ventilating Magazine.

MANUFACTURERS' OPPORTUNITY—Sales engineer, now employed, well-acquainted New York architects, engineers, trade, also municipal and State engineers, exceptionally well qualified to successfully promote sales in New York and Eastern States markets, desires to correspond with capable firm wishing to open up or extend distribution for product offering merit and scope. Address Box 122, care of Heating and Ventilating Magazine.

WANTED—Copies of THE HEATING AND VENTILATING MAGAZINE for July and August, 1923. Fifty cents apiece will be paid for a limited number of such copies. Address C. R. Mortimer, care of Heating and Ventilating Magazine.

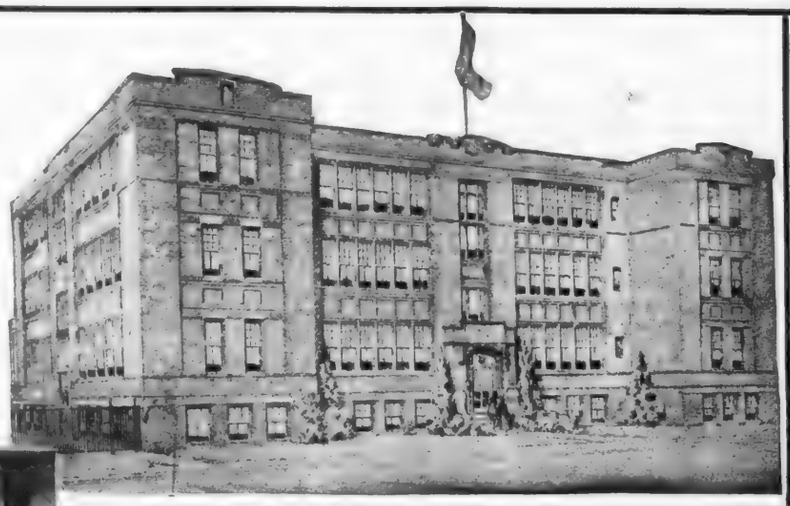
EXECUTIVE AVAILABLE—Sales executive at present connected with a large boiler and radiator company, will be available for managership after January 1. Address Manager, care of Heating and Ventilating Magazine.

BOILER MANUFACTURER wants agents. Address Box 124, care of Heating and Ventilating Magazine

WANTED—Manufacturer's agency wanted for boilers and radiators, or will take over management of branch, on commission basis, by two experienced heating salesmen with big following who can produce results. New York City territory. Correspondence confidential. Address Box 125, care Heating aand Ventilating Magazine.

MANUFACTURED WEATHER
makes
"Every day a good day"
Humidification · Dehumidification
Heating · Ventilation · Purification
Drying
Carrier
Engineering Corporation
750 Frelinghuysen Ave. Newark, N. J.
Boston · Buffalo · Chicago · New York · Philadelphia
SEE OUR DETAILED DATA IN A.S.H.&V.E. GUIDE
SEE OUR DETAILED DATA IN A.S.H.&V.E. GUIDE

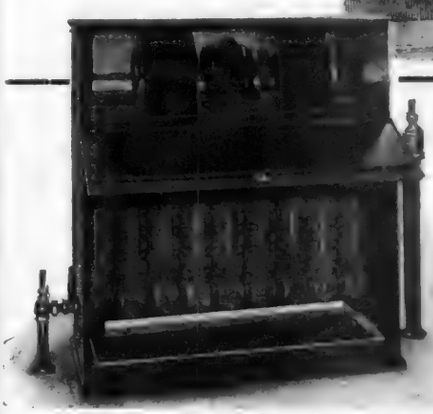
The Peerless unit is a mechanical gem. Has a radiator of the vento type, noted for efficiency; ball bearing motor requiring little attention; fan wheels of aluminum, perfect in design and balance; and a mixing damper without a peer.



Hamilton School Harrison, N. J.

Equipped with seventeen Peerless Units

Joseph W. Baker Architect



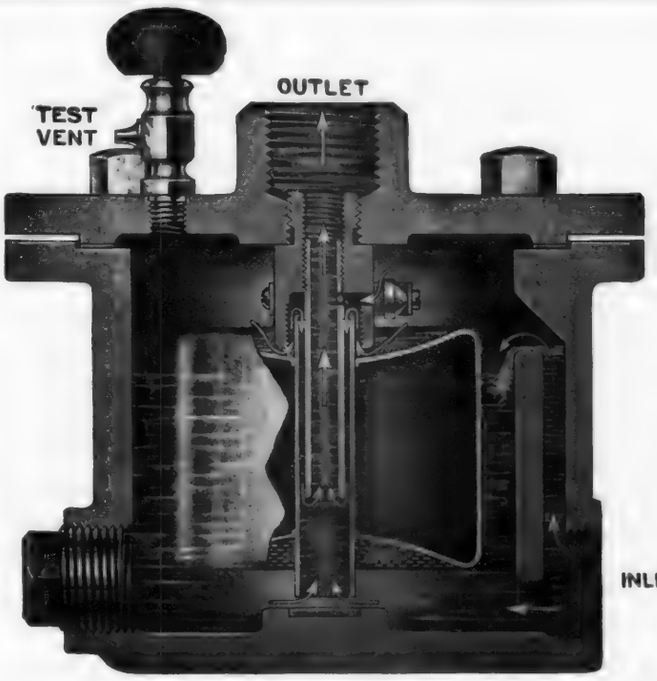
Peerless Unit with front door open showing fans and motor. Front panel and baffle removed, showing special Peerless Vento radiation and humidifying pan.

Service, Efficiency and Economy

Here is a heating and ventilating unit that combines service with efficiency and produces economy. Service in supplying pure fresh air to the required amount with perfect distribution and at the right temperature. Efficiency in the operation of the Peerless mixing damper that will by pass all or any portion of air around the radiator and economy in installation cost and the saving of fuel.

Familiarize yourself with this Peerless Unit by sending for our catalog.

PEERLESS UNIT VENTILATION CO.
437 West 16 St. New York City



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

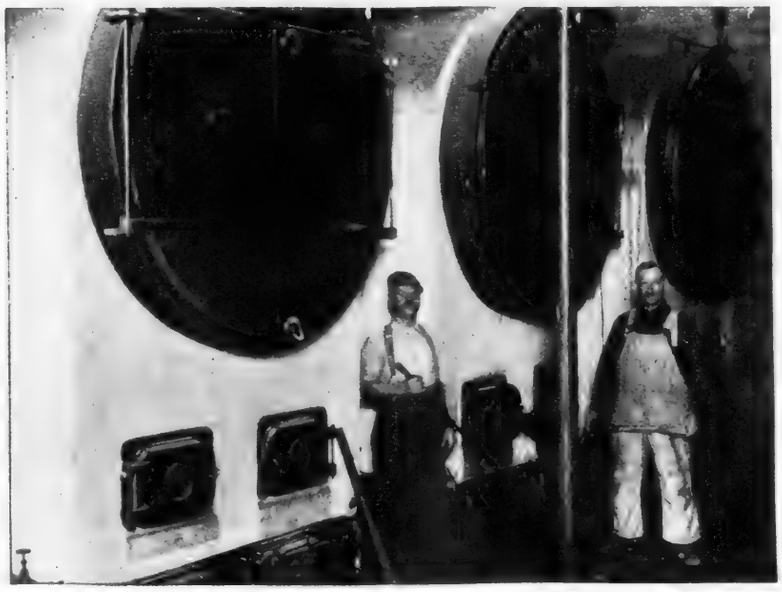
FOUNDED 1865

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

PACIFIC

STEEL HEATING BOILERS



A Battery of three 72" Pacific Smokeless Boilers

STEEL HEATING BOILERS
PACIFIC
WAUKEGAN ILLINOIS

Pacific Smokeless Boilers Are Easy to Operate

Even in the larger sizes Pacific Smokeless Boilers do not require the services of an experienced engineer to operate them, for the method of firing and draft regulation is so simple that any one can handle the job after the first instruction. Unlike other types the Pacific Smokeless Boiler has but one grate to fire and take care of—but one set of draft doors to regulate.

To properly fire Pacific Smokeless Boilers the coal is thrown in and allowed to bank up against the smokeless arch—it does not have to be spread evenly over the grates—and the firing doors in the largest Pacifics are never more than waist high.

Notice the height of the firing doors in the three 16500′ Pacific Smokeless Boilers illustrated and compare it with that of other types of steel smokeless boilers.

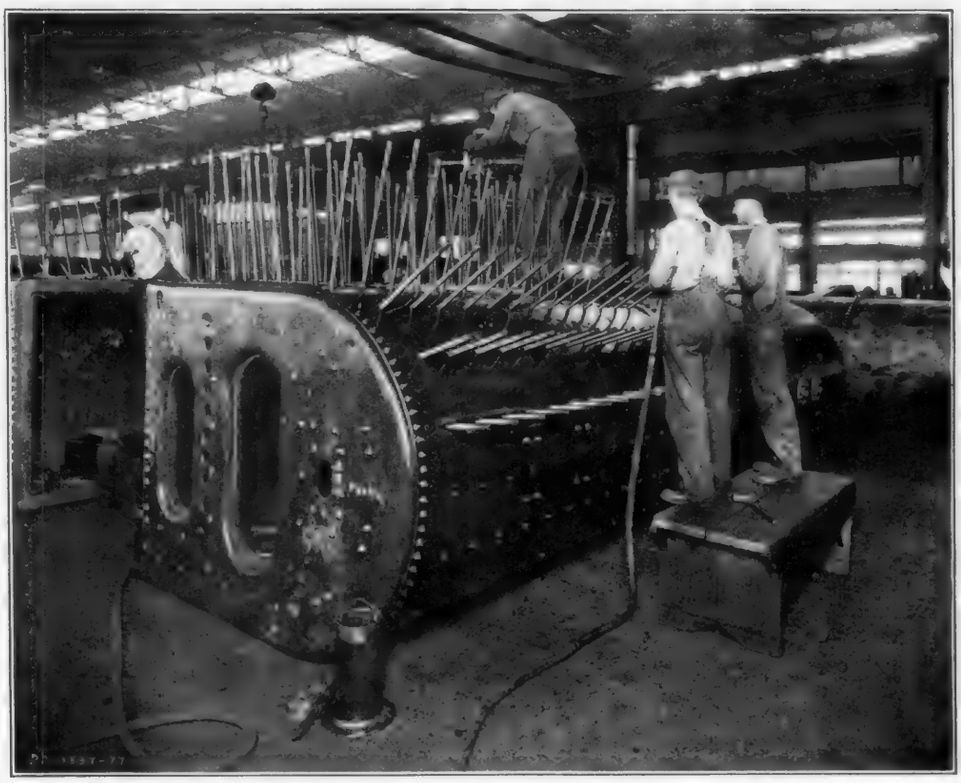
General Boilers Company

Manufacturers of

Pacific Steel Heating Boilers, Hot Water Supply Tanks

Waukegan, Illinois

KEWANEE



Putting in the "stay-bolts" of a Kewanee Boiler. From start to finish they are hand-tailored, by the most skillful workmen, of the huskiest, most dependable material known—*steel.*

KEWANEE BOILER COMPANY

KEWANEE, ILLINOIS

Steel Heating Boilers, Radiators, Tanks, Water Heating Garbage Burners

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ATLANTA	1521 Candler Bldg.	EL PASO	226 Mesa Ave.	PHILADELPHIA	510 Real Estate Trust Bldg.
CHARLOTTE	P. O. Box 292	INDIANAPOLIS	509-10 Occidental Bldg.	PITTSBURGH	Empire Bldg.
CHICAGO	822 W. Washington Boul.	KANSAS CITY	2014 Wyandotte St.	ST. LOUIS	4200 Forest Park Boul.
CINCINNATI	P. O. Box 75	LOS ANGELES	420 E. Third St.	SALT LAKE CITY	204 Dooly Bldg.
CLEVELAND	706 Rose Bldg.	MEMPHIS	1812 Exchange Bldg.	SAN ANTONIO	506 Calcasieu Bldg.
COLUMBUS	808 First Nat'l Bank Bldg.	MILWAUKEE	835 Mer. & Mfrs. Bldg.	SAN FRANCISCO	216 Pine St. Rm. 210-11
DALLAS	809 Southwestern Life Bldg.	MINNEAPOLIS	708 Builders Exchange Building	SEATTLE	Central Bldg.
DENVER	514 Boston Bldg.	NEW YORK	47 W. 42nd St.	SPOKANE	244 Sprague Ave.
DES MOINES	315 Hubbell Bldg.			TOLEDO	1121-22 Nicholas Bldg.
DETROIT	1772 Lafayette Boul.			TULSA	Oxford Hotel

CANADIAN REPRESENTATIVES—Dominion Radiator and Boiler Co., Ltd.
Toronto, Ont., Montreal, Que. Winnipeg, Man., Hamilton, Ont., St. John, N. B., Calgary, Alta.

IMICO HEATING BOILERS

For Water and Steam

Various Sizes

Imico Vacuum Heating System

Write For Catalogue

Manufactured by

ILLINOIS MALLEABLE IRON CO. Chicago, Ill.

"Oil City" Boilers for Heating

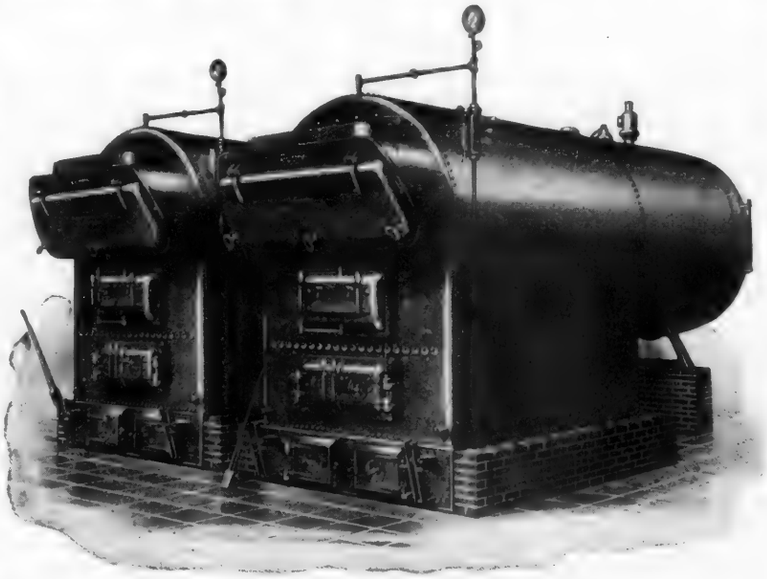
Return Tubular Portable Firebox

Will burn any kind of fuel,—hard or soft coal, oil, gas or lignite. Note use of high firebox, giving ample combustion area to make possible the use of low-grade fuels.

Why "Oil City" Boilers are Ideal for Heating Work:

These boilers are adaptable for Apartments, Churches, Club Houses, Court Houses, Hospitals, Garages, Hotels, Office Buildings, Large Residences, Post Offices, Schools, etc., because they are Safe, Efficient, Dependable, and, being Self Contained, require little attention.

Circular H-5, H-7, H-12, H-13, gives Full Specifications, Ratings and Weights.



Built of Steel, in Accordance with the A. S. M. E. Code

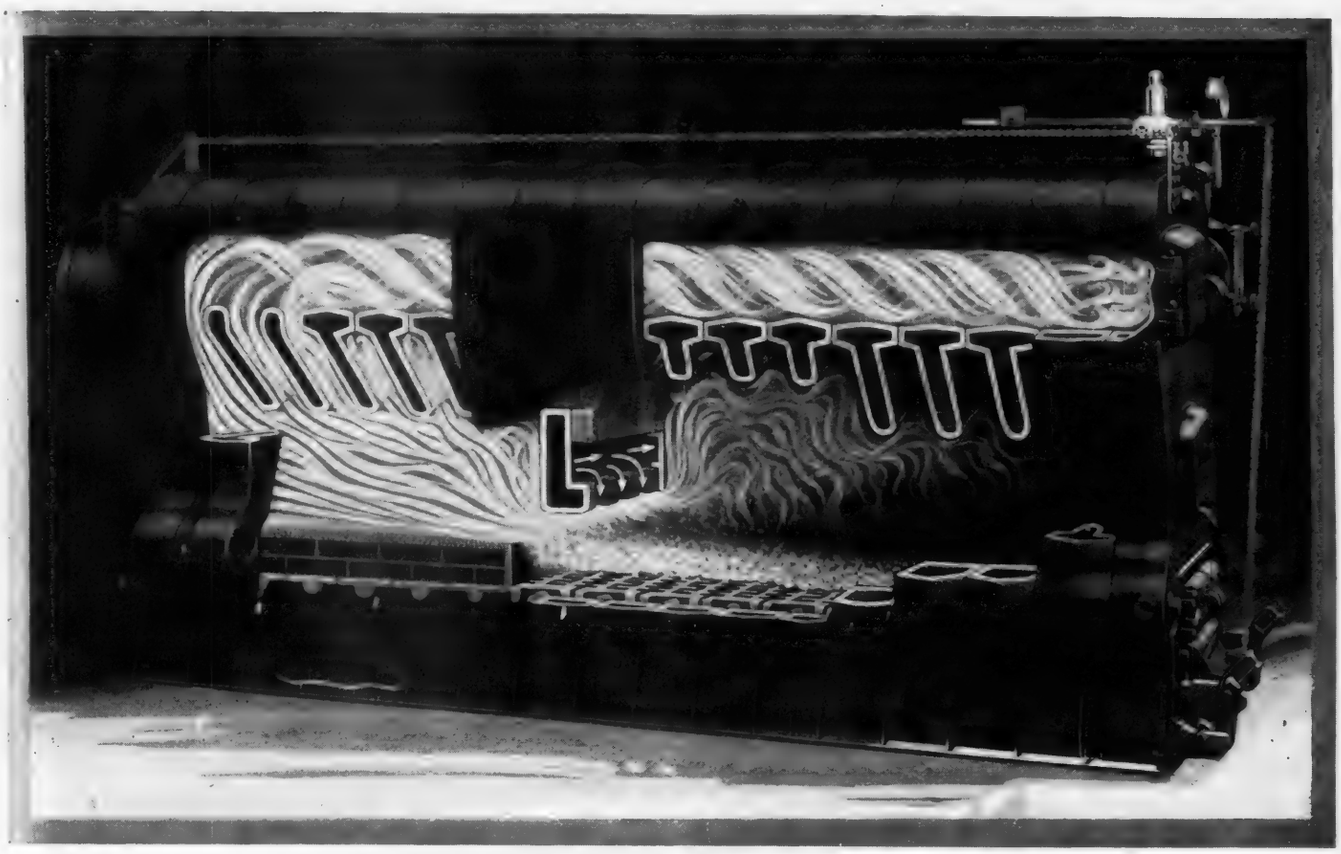
OIL CITY BOILER WORKS, OIL CITY, PA.

BRANCH OFFICES:

NEW YORK, 501 Fifth Ave. CHICAGO, 308-19 W. Jackson Blvd. PITTSBURGH, House Building
HOUSTON, TEXAS, 410 Union Nat'l Bank Bldg. LOS ANGELES, CALIF., 404 Union Bank Bldg.
SALT LAKE CITY, UTAH, 819 McIntyre Bldg.

REPRESENTATIVES

CLEVELAND, OHIO PHILADELPHIA, PA. ATLANTA, GA. DENVER, COL. WICHITA, KANSAS
BALTIMORE, MD. CAMBRIDGE, MASS.



View of SUPER-SMOKELESS Boiler showing Fire-Travel and Patented Baffle Wall with Water-Jacketed Air Openings directly above the rear of the Firebox.

Construction of the UTICA-IMPERIAL SUPER-SMOKELESS BOILER

Cast iron sectional construction; more resistant to corrosion than steel; easy to ship and install in completed buildings. Patented baffle wall at rear of fire box has openings which provide additional air (oxygen) to the gases, thus producing incandescent flames that consume all smoke and soot as fuel. Air openings are water-jacketed and protected by cast iron plate; the patented baffle wall is faced with special plastic fire brick.

UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

Burn Soft Coal Smokelessly and Use Any Available Fuel

All types of large buildings are heated with greater economy by SUPER-SMOKELESS Boilers. Fuel requirements are surprisingly low and practically any grade of soft coal can be utilized with very efficient results.

Smokeless operation of SUPER-SMOKELESS Boilers is entirely successful. In cities where smoke ordinances are rigidly enforced, foremost engineers and heating contractors specify SUPER-SMOKELESS Boilers with entire confidence in their ability to comply with the law.

Replacements with SUPER-SMOKELESS Boilers show striking contrasts in annual fuel costs. Savings of fifty per cent are repeatedly reported. Building owners and technical men have indicated their approval of these scientific boilers by installing them in thousands of important buildings.

Complete descriptive catalog containing all essential data regarding SUPER-SMOKELESS Boilers will be sent upon request. The special Timmis Report is also available.

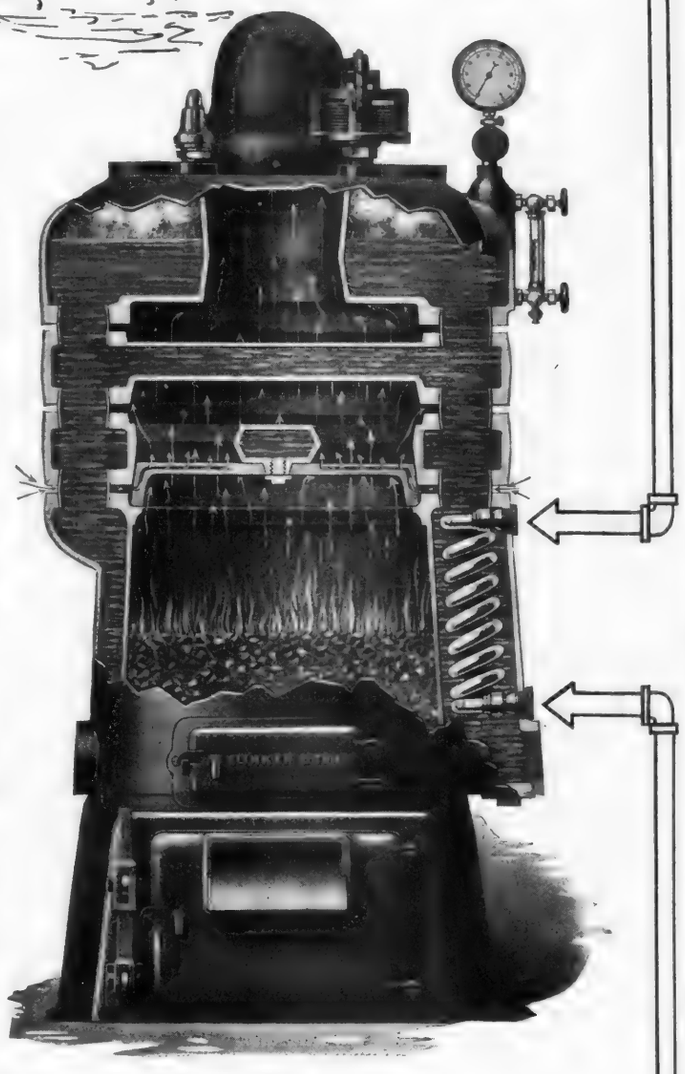
UTICA HEATER COMPANY

UTICA, New York

218-220 W. Kinzie St. CHICAGO — **707 Union Building CLEVELAND** — **1843 Grand Central Term'l NEW YORK**

Atlanta	Cedar Rapids	Dayton	Harrisburg	Memphis	New Haven	Saint Louis
Birmingham	Charlotte, N. C.	Denver	Indianapolis	Milwaukee	Omaha	Toledo
Boston	Cincinnati	Detroit	Kansas City, Mo	Minneapolis	Philadelphia	Washington
Buffalo	Columbus	Grand Rapids	Louisville	Nashville	Pittsburgh	Salt Lake City

Heat and Hot Water From the Same Fuel at the Same Time



Now Heat and Hot Water for domestic purposes are supplied by **one unit.**

The ABCO Boiler, with a **Coil** as an **integral** part, supplies an abundance of hot water from **one** fire, any time of the day or night. That cuts fuel costs.

There is no danger from scalding water, for the clear water traveling through the coil is heated only by boiling water.

ABCO Boiler cuts the initial investment and installation cost about $15.00 from the cost of a boiler with a separate coil. That enables steamfitters to bid lower on competitive work and **clinch contracts** they might otherwise lose.

ABCO BOILER

"The Boiler with the Coil"

is the only **one unit** system. It is **not** a makeshift. No external coils or fire-pot coils. No way for the ABCO Coil to be subjected to destructive action of direct combustion. No heat units lost in transmission.

More Sales And Bigger Profits

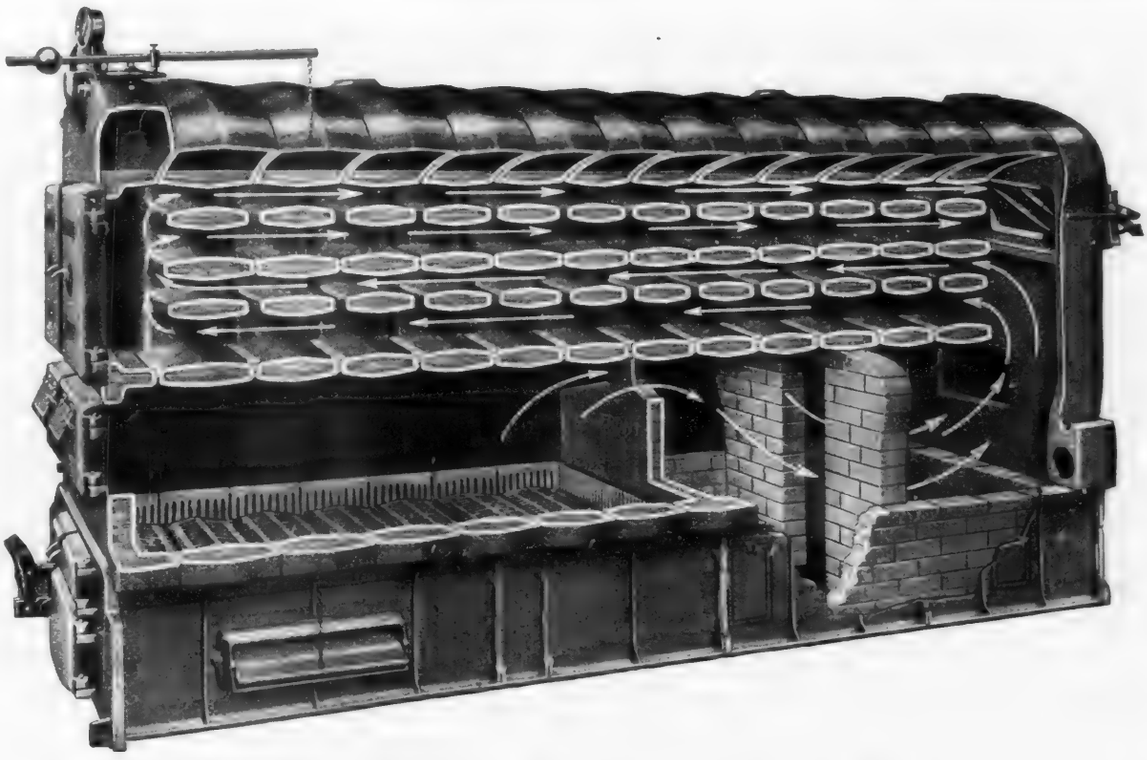
You don't have to waste time talking about the good points of the Abco Boiler with the coil. Anyone can quickly **see** its big advantages, which, with the saving in cost over buying two or three units, enables you to increase sales and profits.

Write today for our special proposition.

ADVANCE BOILER CORPORATION

Manufacturers of Round and Square Smokeless Sectional Steam and Water Boilers for Anthracite and Bituminous Coal.

Grand Central Terminal, New York, N. Y.



Simple methods give real results
with

INTERNATIONAL ECONOMY
SMOKELESS BOILERS

Extreme simplicity in design of this boiler makes it very desirable to install and very satisfactory to operate. Expert janitor service is not required.

It is a single grate up-draft boiler, especially suitable for burning soft coal smokelessly, but which also gives excellent results with any fuel ordinarily used for heating purposes.

Grate connections are outside of the ashpit where they cannot clog or become warped. Auxiliary air is admitted thru the feed door which makes it convenient to control and to prevent excess air. The smoke consuming device is back of the fire box and practically independent of the fireman. All flue surfaces are easily cleaned from the front of the boiler as there are no dead pockets to collect soot.

Economy Boilers Deliver Dry Steam

No headers are necessary; this means a marked saving on installation cost.

New catalog F1611-H just off the press. Copy on request.

INTERNATIONAL HEATER COMPANY

Makers of Heating Apparatus

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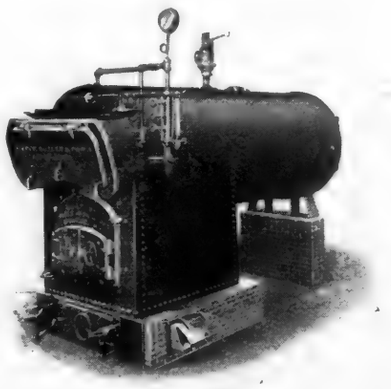
RECENT INSTALLATIONS of

AMES FIREBOX HEATING BOILERS IN NEW YORK APARTMENTS:



Ames Firebox Heating Boiler with Plain Furnace

Roosevelt Apartment Building, 171st St. and Grand Concourse, New York City.
Two boilers 4,000 sq. ft. capacity each.
Four boilers 10,000 sq. ft. capacity each.

Apartment Building, Sherman Ave. and McClellan St., Bronx, New York City.
Three boilers 6,500 sq. ft. capacity each.

Apartment Building, 109th St. and Riverside Drive, New York City.
Two boilers 16,500 sq. ft. capacity each.

Apartment Building, Mosholu Parkway, North Hull and Perry Ave. Bronx, New York City.
Two boilers 11,500 sq. ft. capacity each.

Apartment Building, University Ave. and Featherbed Lane, Bronx, New York City.
Two boilers 4,000 sq. ft. capacity each.

Let our engineers tell your more about Ames Boilers.

AMES IRON WORKS

HIGH PRESSURE DIVISION OF THE

PIERCE, BUTLER & PIERCE MANUFACTURING CORPORATION

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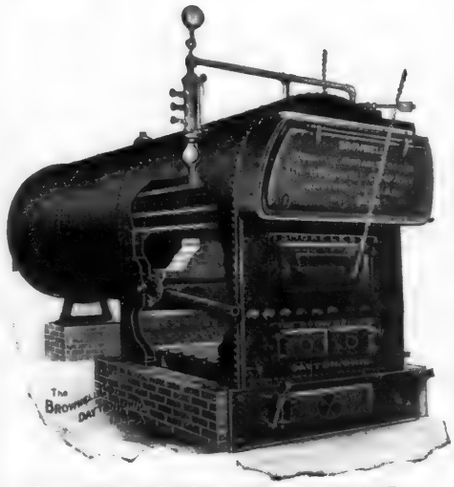
STEEL BOILER

WHY



Brownell Return Flue Portable Boiler—Smokeless Type

COST: Arrives on job and installed in one piece.
No cost of assembling sections.
Low insurance cost.

EFFICIENCY: High thermal conductivity.
High tensile strength, uniform in thickness.
Generous and properly designed firebox, permitting complete combustion.
Easy access for cleaning, insuring clean heating surfaces.

MAINTENANCE: Boilers capable of standing sudden and extreme changes of temperature because of high factor of safety, and nature of material.
No long and expensive shut-downs for repairs because of waiting for new parts.

BROWNELL

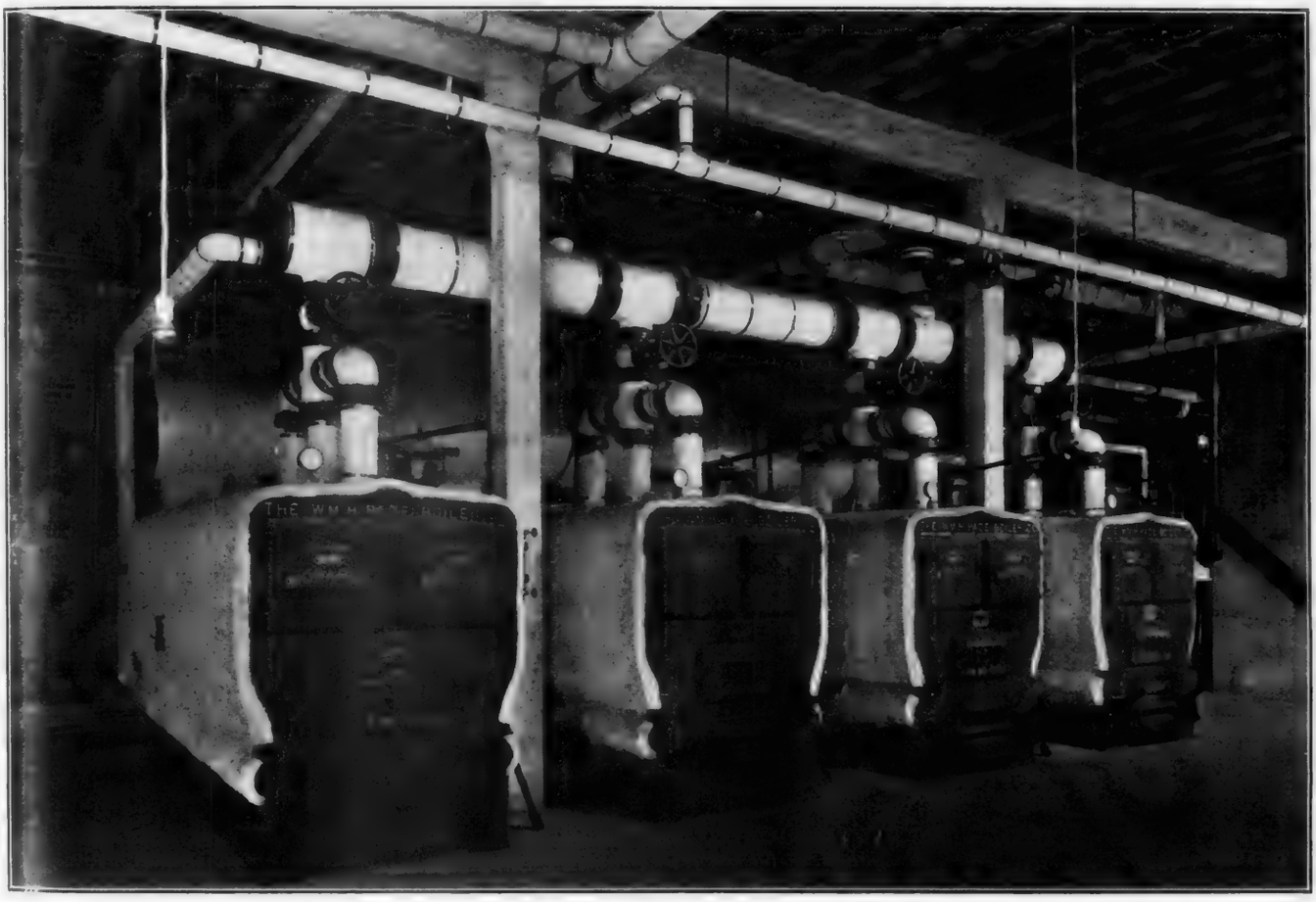
Backed by 68 years of boiler experience.
Thoroughly inspected during construction and upon completion.
You take no risk in buying a Brownell Boiler.
Allow us to eliminate your heating troubles.
Sales representatives in all large cities.

THE BROWNELL CO., DAYTON, OHIO

ESTABLISHED 1855

PAGE BOILERS

"The Distinguished Service Line"



Battery of Four S-40-18 Monarch Up-Draft Smokeless Boilers installed in Meadville High School, Meadville, Pa.

For Heating Hotels, Hospitals, Schools, Churches, and all large buildings. Burns all grades of hard or soft coal SMOKELESSLY and with exceptional economy. Can also be equipped for burning fuel oil.

We shall be pleased to send you our 120-page Catalogue of Round and Square Boilers.

THE WM. H. PAGE BOILER COMPANY

Established 1856 Incorporated 1877

Makers of Boilers for over Half a Century

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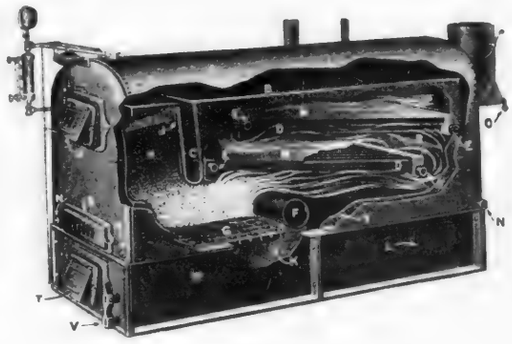
HERBERT



A Good Combination

The latest type of Herbert Magazine Water Tube Smokeless Boiler combines the downdraft and direct draft features, and eliminates the objectionable factors of both.

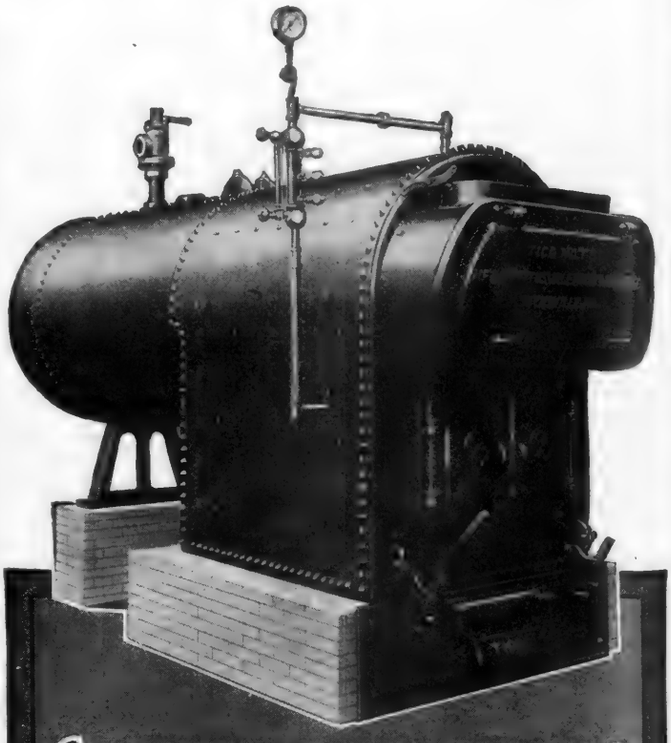
This combination enables the Herbert Boiler to successfully meet all weather conditions.

A Few Additional Features Which Should Be Considered

No flues to clean.
Burns soft coal successfully.
Natural draft and the highest economy.
All shell surface, which means economy.
No brick arches or other flimsy devices.
No smoke after the fire is thoroughly started.
Built in steam sized from 500 to 25,000 square feet.
Carries steam from twelve to fifteen hours with one fire.
Can be set in brick, which gives one more return of the hot gases.

HERBERT BOILER COMPANY

Root & LaSalle Streets
Chicago, Illinois



"TICO"
RETURN TUBULAR FIREBOX BOILERS

"Tico' Return Tubular Firebox Portable Boilers

The compact and rugged design, economy of fuel and repairs, ease of firing, and quick steam qualities combine to make

"Tico" Return Tubular Firebox Portable Boilers

the most practical and most satisfactory boilers on the market for heating. All TICO BOILERS are constructed in exact accordance with the A. S. M. E. Boiler code and are thoroughly inspected and approved before shipment.

Our Bulletins give complete details.

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Titusville, Penna.

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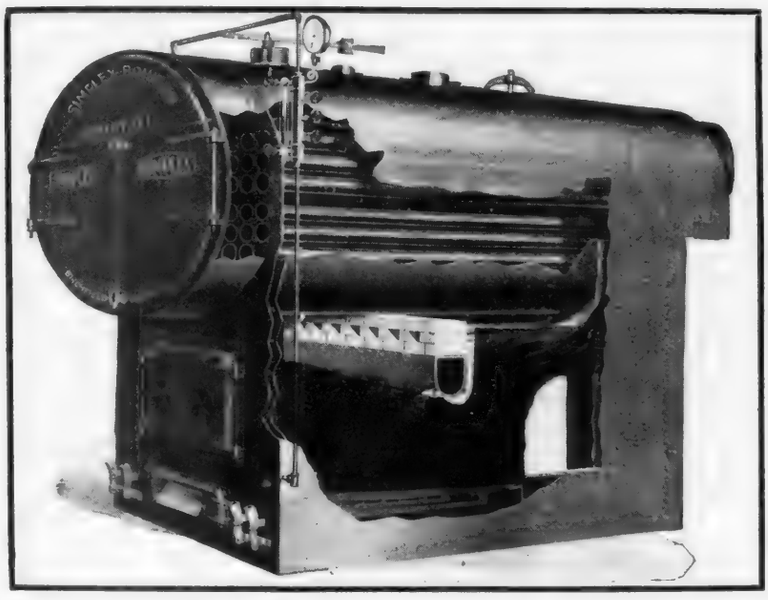
TITUSVILLE IRON WORKS CO.
TITUSVILLE, PA.

SIMPLEX BOILERS



A heating boiler of the latest approved type embodying utmost simplicity of design and construction with outstanding advantages in efficiency economy and convenience

Simplex Smokeless Steel Heating Boilers combine both fire box and double return tubular types into one. Built of extra heavy flange steel according to A. S. M. E. code; electric arc welded. Large heating surface and flue area, long fire and gas travel. Complete wall of water, with absolutely free circulation. Come all in one piece (except base)—easily and quickly set up without rivets or brick work to leak air and spoil fire control. Built in all sizes for *steam or hot water*. Burn any kind of coal smokelessly; especially efficient with oil; also burn gas or wood. Save 25% to 40% fuel. Compact and economical of floor space. All flues cleaned from the front; smoke connection in rear. Accurately rated, and guaranteed—known wherever used for the ease with which they maintain required temperature in all weathers.

Simplex Water Heating Garbage Burners afford the same advantages in design, construction and efficiency.

For full description, illustrations, drawings and specifications, write our general sales offices.

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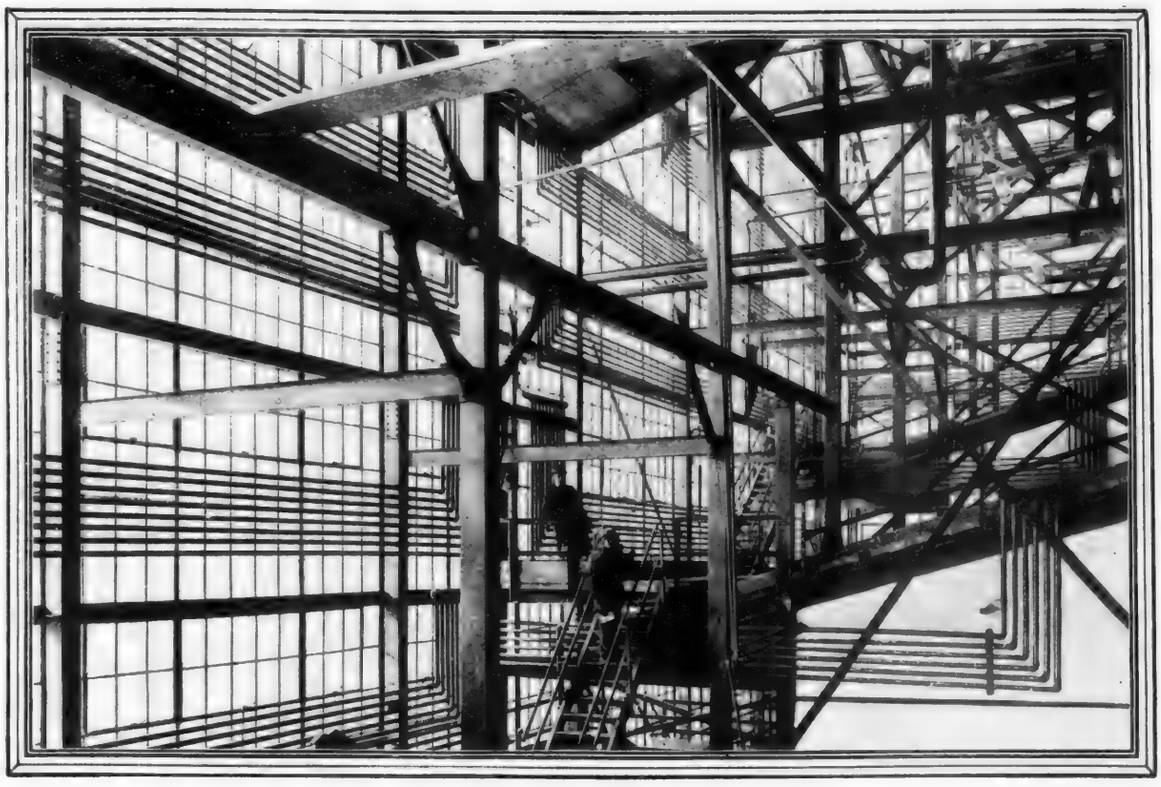

In the large breaker room of the Loomis Colliery, at Nanticoke, Pennsylvania, pictured above, uniform heating and effective lighting help toward maintaining high operating efficiency at all times of the year.

An entire carload of Crane pipe fittings was used in the heating coils of this building.

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GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVE., CHICAGO

Branches and Sales Offices in One Hundred and Forty Cities
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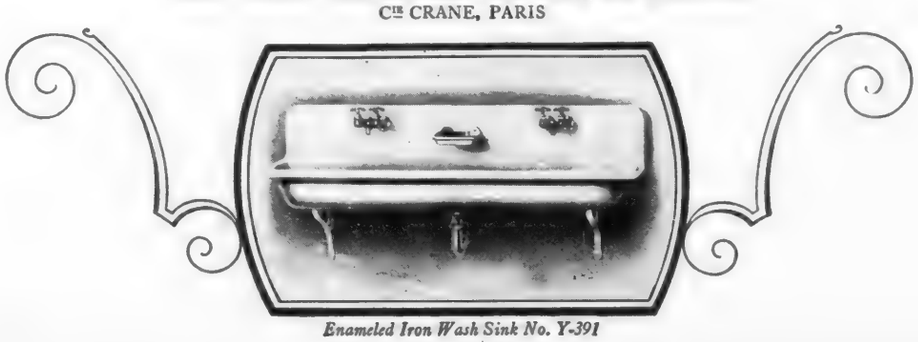
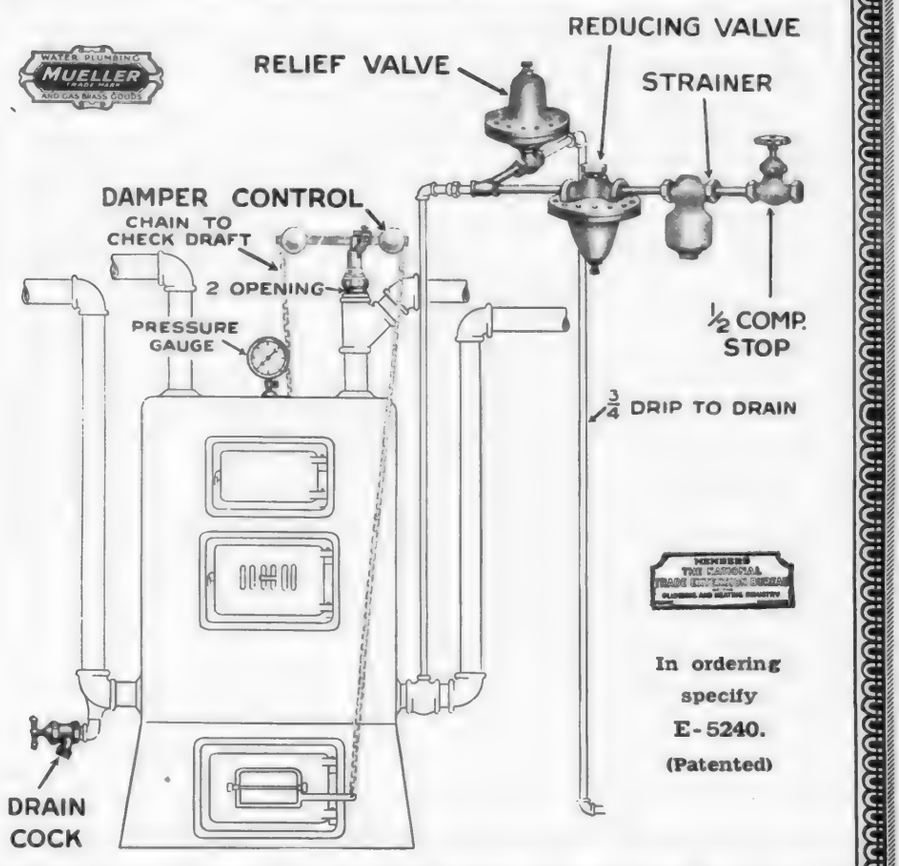


Enameled Iron Wash Sink No. Y-391



Quick Sales and Satisfied Customers

come to plumbers and heating contractors handling the **MUELLER** Automatic System of Hot Water Heat Control. There is a popular demand for it, and it will pay to specialize on this system which gives lasting satisfaction.

Mueller Automatic System of Hot Water Heat Control

removes to the greatest degree the care and responsibility of attention to the heating system—that's what the householder wants—that's why they like the **MUELLER** System—no expansion tank—no worry—no trouble.

Heating troubles are still fresh in mind. Good time to get after business at a good profit. Write your jobber or us.

H. MUELLER MANUFACTURING CO., Decatur, Ill., U. S. A.

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New York City, 145 W. 30th Street
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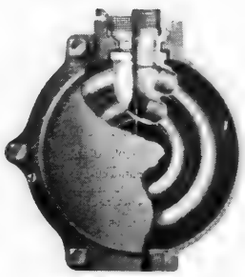
Mueller Metals Co., Port Huron, Mich., Makers of "Red Tip" Brass Rod; Welding Rod; Brass and Copper Tubing; Forgings and Castings in Brass and Bronze; also Brass Screw Machined Products.

Installed over One Hundred Excelso Heaters

One of Detroit's Best-Known Heating Contractors Builds Profitable Excelso Business.



TOP VIEW

Excelso Double Coil Heater for Large Installations.

Gentlemen:—

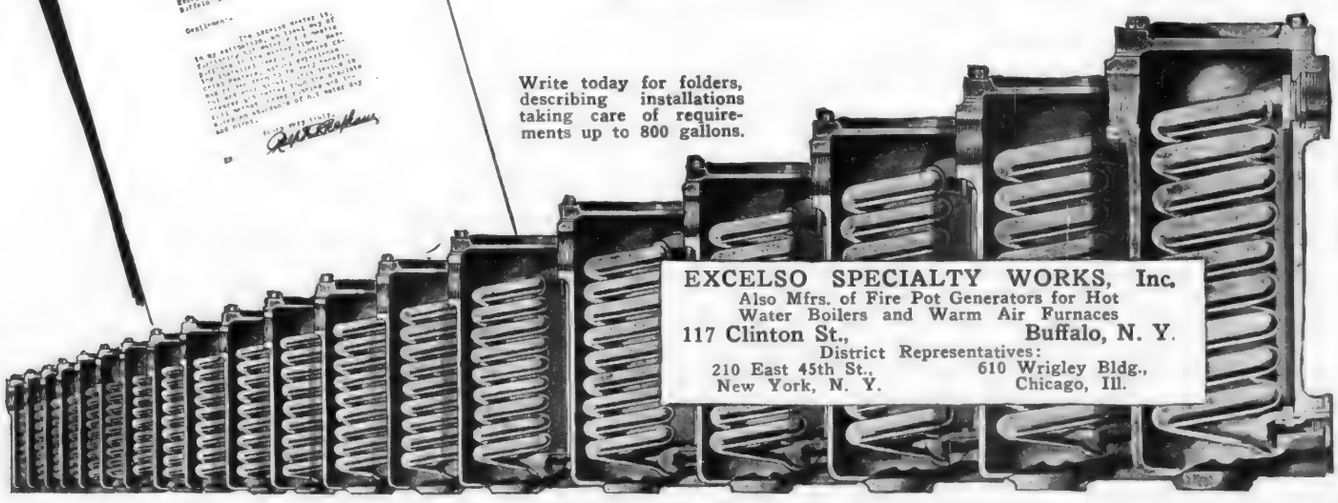
The Excelso Heater is, in my estimation, an ideal way of furnishing hot water for domestic purposes in the winter time. Having installed over one hundred Excelso Heaters, actual experience has proven them to be very beneficial and economical. This device is cheaper and better than the obsolete coil method, never rumbles and insures an abundance of hot water day and night.

Yours very truly,
RALPH P. PECKHAM,
Detroit, Mich.

Specify the ORIGINAL Indirect Heater

When you specify the Excelso Water Heater you are recommending the one Indirect Heater that is furnishing low-cost, hot water comfort in over 50,000 homes, apartments, and other medium size buildings. It does not require a separate fire and is easily connected to the outside of the steam or vapor heating boiler using present tank and connections.

Write today for folders, describing installations taking care of requirements up to 800 gallons.



EXCELSO SPECIALTY WORKS, Inc.
Also Mfrs. of Fire Pot Generators for Hot Water Boilers and Warm Air Furnaces
117 Clinton St., Buffalo, N. Y.
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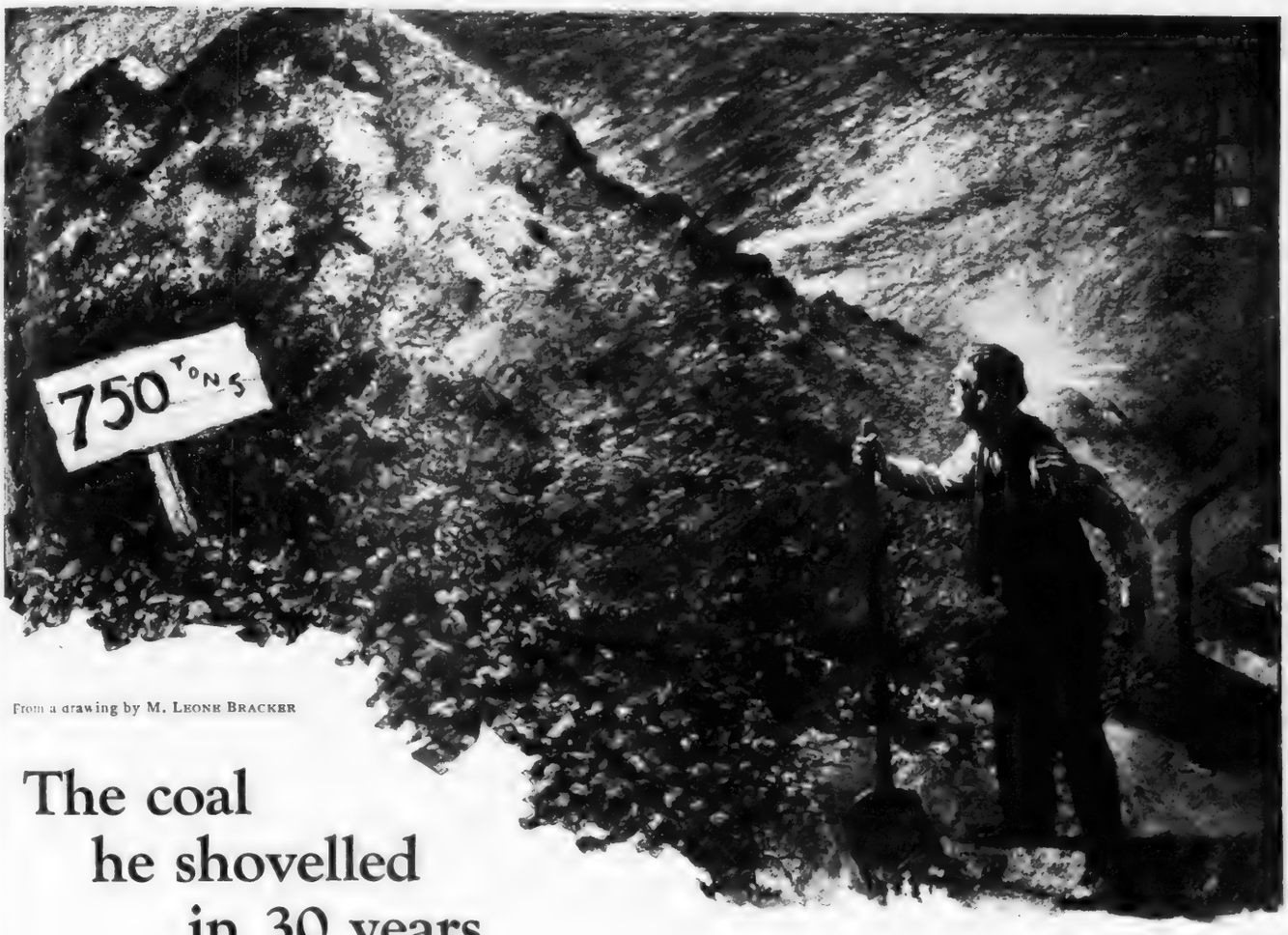
Sold by All Plumbers and Steamfitters



From a drawing by M. LEONE BRACKER

The coal he shovelled in 30 years

—*a true story for Architects and Heating Engineers*

LET US tell you the story of a home-owner in Evanston, Illinois.

He has had an IDEAL Boiler in his cellar for thirty years; it cost him new, about $275 (without radiators and piping).

His house is large. In these thirty years he has shovelled more than 750 tons of coal which, at an average cost of $10 a ton, amounts to $7,500 or 27 times the original cost of the boiler itself!

Three things can be learned from this story:

1 How amazingly IDEAL Boilers last. In thirty years there have been no repairs except a new grate, the old one having been "burned out through carelessness."

2 How little any boiler costs in comparison with the cost of the coal it burns. Since the difference in the first cost is so small, it is wisdom to urge clients to buy the best.

3 There have been many improvements in IDEAL Boilers, just as there have been improvements in automobiles. It would pay any home-owner to take out his old heating apparatus and install a modern IDEAL Boiler. It would cut his annual coal bill one-third, which would quickly pay for the new boiler.

We wonder how many home-owners actually realize how trifling is the first cost of their heating plant compared with the coal they burn! We are stressing this thought to millions of home-owners through the national magazines. Isn't it pretty sound logic to preach to your clients?

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

104 West 42nd Street, Dept. T-187
NEW YORK

AMERICAN RADIATORS | IDEAL BOILERS

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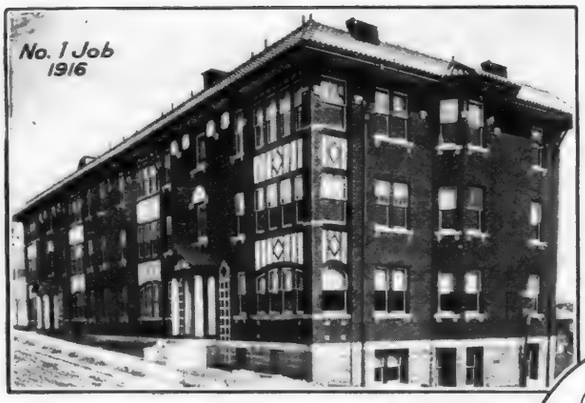
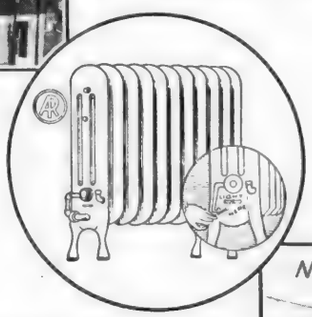


ASK us why the owner of the two buildings shown here installed Job No. 2 with the Automatic Gas-Steam Unit Radiators after an experience of seven years with this type of heating in Job No. 1

IS a hot water or steam-contained standard cast iron radiator the proper method of obtaining *Heat Distribution?* You will probably say *Yes* if the cost to keep the radiator supplied with heat energy is not prohibitive.

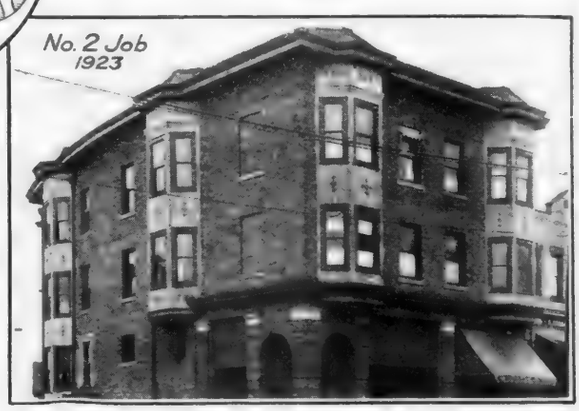
YOU install a boiler central heating plant of sufficient capacity to carry the peak load, but the peak load is but a fraction of the 181-day heating period.



WHY not use the self generating unit radiator system. Each under automatic control.

Steam Heat Without Boiler

100% efficient on fuel—5 lbs. steam.
Humidified or dry heat, as you wish.



THIS system is applicable to the largest jobs, also to a single radiator job.

Where a boiler is not practical for many reasons—the Automatic Unit Radiator is the answer—Write for catalog.

Apply for agency now to

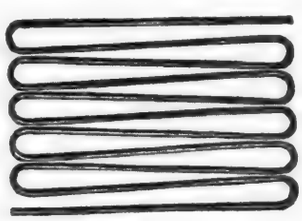
AUTOMATIC GAS-STEAM RADIATOR CO.

FULTON BUILDING PITTSBURGH, PA.

JOHN SIMMONS CO

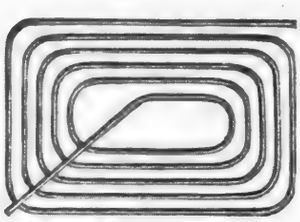
110 CENTRE STREET - NEW YORK

PIPE COILS and BENDS



Collapsed Coil

Closed Flat Coil



Tank Coil

We bend up to 16" and weld up to 36" Pipe. No job too difficult. We are specialists in this line and solicit your specifications for estimate. Our Coil and Bend Folder sent on request.

Plumbing Supplies :: Genuine Wrought Iron and Steel Pipe :: Fittings

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Equipped with 31 UNIVENTS
STEPHEN-STEPHEN & BRUST, *Architects*
Seattle, Washington

BLYTHE PLUMBING & HEATING CO.,
Heating and Ventilating Engineers,
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Building a Human Monument

The greatest monument to the American Heating Engineer today, are the millions of bright-eyed, alert children who attend our public schools. They are living flesh and blood testimonials to those who incorporate the most modern ideas on sanitation, light and ventilation in the school buildings they plan.

The Univent is the heating engineer's ideal of perfect ventilation. Direct, vitalizing air from the windows distributed uniformly in each room without draft. We shall be glad to co-operate with heating engineers.

Write for our book, "Univent Ventilation."

UNIVENT
"LIVE OUTDOORS-INDOORS"
(TRADE MARK)

If it isn't manufactured by The Herman Nelson Corporation it isn't the Univent

THE HERMAN NELSON CORPORATION *Moline, Ill.*

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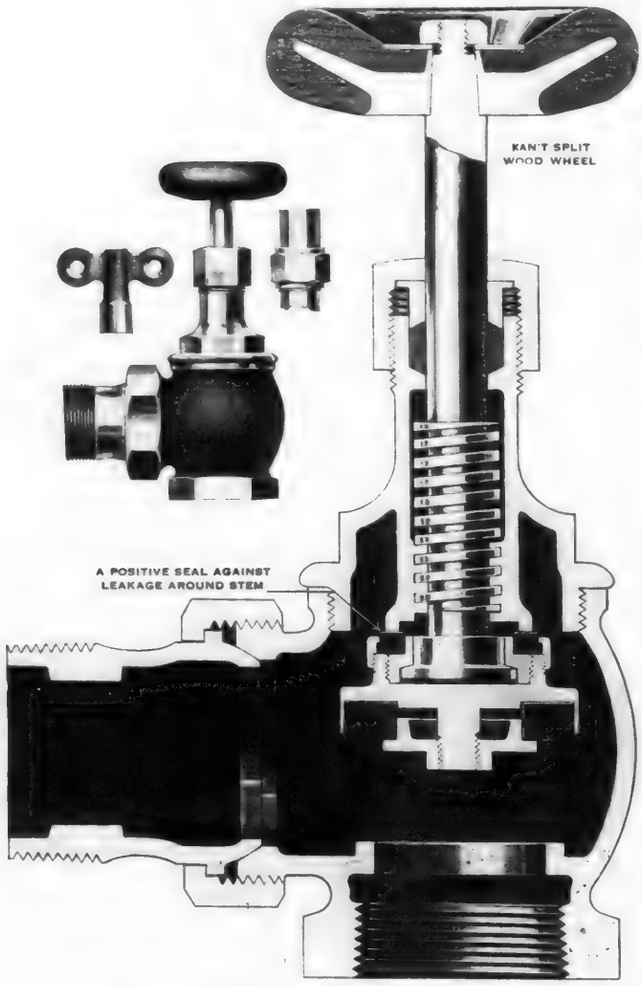
MARSH SPECIAL DOUBLE-SEAT VALVES

We wish to call to your particular attention that these valves are furnished with a "KANT-SPLIT" wood wheel, GLAND in stuffing-box, an UPPER DISC, the same as lower disc, and MACHINE FINISHED SEAT IN BONNET, same as seat in body, providing against any possibility of leakage around stem when valve is fully open; A VALUABLE IMPROVEMENT IN VALVE CONSTRUCTION, used in all MARSH valves.



Marsh Special Radiator valves were designed for use, where something better than competition valves is required, at practically competitive prices. In other words, a strictly high grade valve *at a very moderate cost.*

Let us send you catalogue and discounts

MARSH VALVE COMPANY

DUNKIRK, N. Y.

Simply Constructed

COMMONWEALTH Lavigne Hot Water Radiator Valves are characterized by their simple, sturdy construction.

The working parts have no springs, screws or sheet metal parts to get out of order. The entire valve is made from brass rod and casting—the shell and stem being cast in one piece. The stem is packed with an asbestos ring having a metal insert and the up-and-down motion of the shell prevents sticking. Commonwealth Lavigne Radiator Valves embody the most modern ideas in valve design but they are made and sold on the old-fashioned idea of one hundred cents of value to the dollar. You should use these valves on every heating installation.

In addition to a full line of standard Radiator Valves, also manufacturers of the Lavigne Packless Quick Opening Steam Radiator Valve.

Your jobber can supply you.

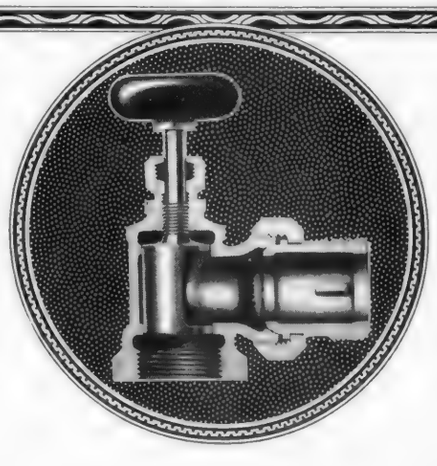
COMMONWEALTH BRASS CORPORATION

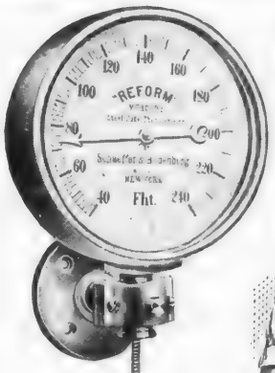
DETROIT, MICH.

New York *San Francisco* *Chicago*

MANUFACTURERS OF

COMMONWEALTH LAVIGNE RADIATOR VALVES





Columbia
Reform Thermometers
take care of Hard-to-get-at Places

A DIAL Thermometer is always more quickly, easily and accurately read than a mercury tube thermometer—that's the first big advantage of the Columbia Reform Thermometer.

The second big advantage is that, regardless of the location of the point at which the temperature is to be taken, the dial of this thermometer can always be placed out in the open where it can be read at a glance.

The bulb is installed in a feed-water pipe, condenser, economizer, or any other point, and the dial wherever it is most convenient to read same.

The Columbia Reform Thermometer puts an end to all the old difficulties and exasperations in keeping tabs on temperature at dark or inaccessible points. This obviously means a big saving of time and trouble.

Columbia Reform Thermometers are mercury actuated, therefore as accurate, dependable and sensitive as mercury glass-tube thermometers.

This thermometer consists of a steel bulb, steel capillary tube and steel coil spring, all filled with mercury. The connecting tube can be supplied any reasonable length and the bulb is furnished for all applications.

Made for temperature ranges from 30°F. below to 1000 above zero.

Our interesting catalog No. N-14 sent on request.

American Schaeffer & Budenberg Corporation
SUCCESSORS TO
Schaeffer & Budenberg Mfg. Co.
AND
American Steam Gauge & Valve Mfg. Co. Division

Brooklyn, N. Y.

*Boston	Cleveland	New Orleans
Buffalo	Detroit	*Pittsburgh
*Chicago	*Los Angeles	Philadelphia

*Stock carried at these branches.

S & B American Steam Gauge
Columbia Recording Gauge
American Water Relief and Pop-Safety Valves
American Ideal Steam Trap
American-Thompson Improved Indicator
American H₂O Grease Extracting Feed Water Filter
"Redline" Differential Draft Gauge
Columbia Recording Thermometer
"Crescent" Thermometer
S & B U Gauge
S & B Engine Register
American Gauge Tester
S & B Counter

"—like driving an automobile by spurts and stops"

WHEN more heat is needed in a room the proper way to get it is to open a valve or damper to a definite position corresponding to the increased requirement and then hold that position until the requirement changes. To operate the heat controlling valves or dampers alternately wide open and completely closed is like driving an automobile by spurts and stops, alternately turning on and shutting off all of the power. The principle is obviously wrong. Yet, in the control of the heat source

Only the Powers System Gives True Gradual Control

It holds valves or dampers sufficiently open so that necessary heat is steadily delivered to maintain the correct temperature. The powerful Vapor Disc Thermostat operates a double valve—controlling both supply and exhaust of the compressed air, thus acting as a reducing valve giving just the air pressure required to correctly position the heat controlling valves and dampers. Both the exhaust and supply cannot be open at one time—there is no continuous air waste. The valve or damper is positioned, then the air consumption ceases until further change is required.

Uses 90 per cent Less Air than other systems

Excessive use of air introduces large quantities of dust and moisture into the system which results in clogging, and corrosion of air lines and mechanism. These troubles which cause inaccurate control and frequent repairs are eliminated in the Powers System. It uses only 10 per cent of the air required by other systems, and there are no finely restricted air passages or leak ports, no motion multiplying devices which often need attention and repair. These are a few of the reasons why a Powers System is

Lowest in Cost per Year

and why it commonly gives 18 to 25 years of accurate, dependable control, with practically no expense for repairs. The booklet "The Elimination of Heat Waste" shows why the Powers System is "lowest in cost per year." May we send you a copy?

THE POWERS REGULATOR CO.
Specialists in Automatic Heat Control
2718 Greenview Ave., CHICAGO
NEW YORK And 28 Other Offices
BOSTON Your telephone directory will tell
TORONTO you if our office is in your city

(2457)

IN JANITORS QUARTERS

IN OWNERS SUITE

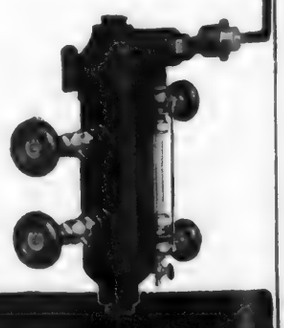
The cracked section season among heating boilers is approaching.

Are you leaving any of the boilers for which you are responsible to the careless mercy of busy janitors?

Don't do it.
Especially when a few dollars will buy a Reliance Safety Water Column No. 0 with an Electric Pressureless Alarm. It's low water signal can be wired at a small extra cost to the parts of the building where the janitor is sure to hear it ringing him the information that the water is low in his boiler.

Write for full technical information.

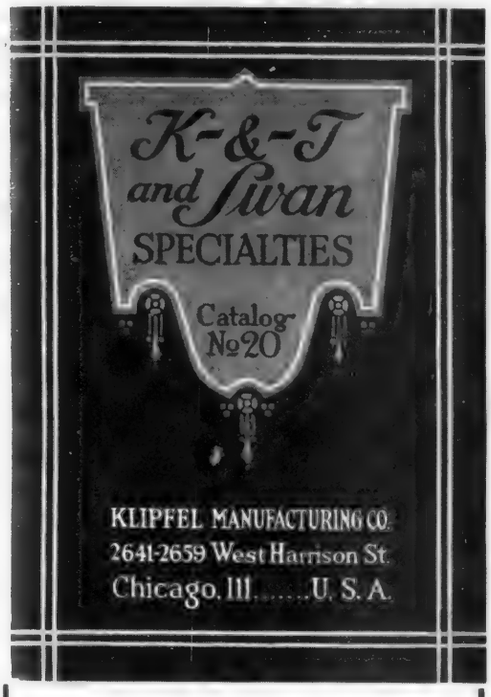
The Reliance Gauge Column Company
5930 Carnegie Ave.
Cleveland
Ohio



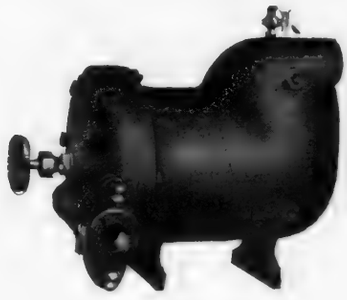
Reliance
Safety Water Columns

Klipfel-Swan Specialties

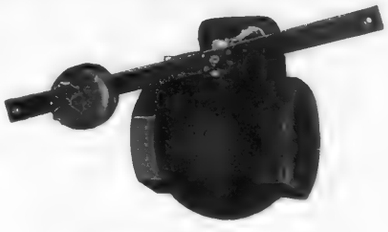
for controlling Pressure, Temperature & Humidity



Balanced Float Valve
with Seamless Copper Float



Improved Continued
Discharged Steam Trap



Patented Noiseless
Back Pressure Valve

THE RIGHT SPECIALTY FOR EACH REQUIREMENT

The Klipfel Manufacturing Company has manufactured Klipfel-Swan Specialties for controlling Pressure, Temperature and Humidity since 1902.

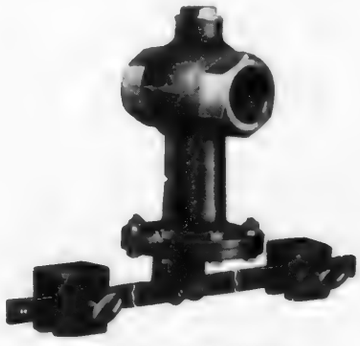
This experience has placed the Company in position to manufacture the right specialty for each requirement. These devices simple, rugged and dependable are the embodiment of a good design and careful workmanship.

Leading engineers specify Klipfel-Swan specialties because they give maximun performance for minimun attention and maintenance cost.

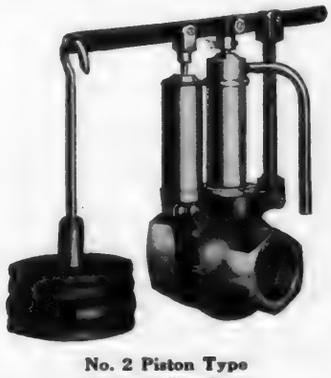
A copy of our catalog should be on your desk. Send for one today.

Klipfel Manufacturing Co.
2641-59 West Harrison Street,
Chicago, Illinois

No. 1 Piston Type
Pressure Regulator



No. 3 Diaphragm Type
Pressure Regulator



No. 2 Piston Type
Pressure Regulator
Expanded Outlet

Klipfel-Swan Specialties

for controlling Pressure, Temperature & Humidity

The DUNHAM
REG. TRADE MARK
HEATING SERVICE

The Worth-While Original Is Ever Imitated

Twenty years ago, the Dunham Radiator Trap was placed on the market. It was new in principle, mechanical design and appearance. Despite a storm of opposition, it immediately proved its superiority to any existing appliance. A short time after its advent, numerous devices appeared conforming as nearly as possible to the same pattern.

But the original Dunham Trap has never been equalled either in sureness and economy of operation or in length of service. The First National Bank Building of Chicago, which uses close on to two thousand Dunham Radiator Traps, points to the fact that, in twelve years, upkeep costs have been so small no record has been kept of them. The Woolworth Building is comfortably heated in every one of its fifty-one stories with a Dunham Vacuum System requiring only a half pound steam pressure.

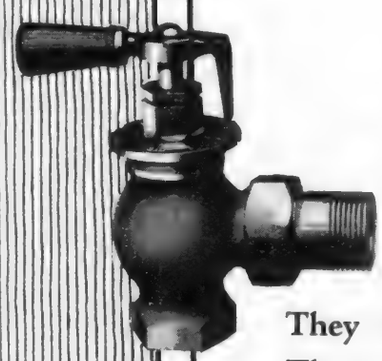
It is a fact, in every walk of life, that on him who blazes a new trail or sets new standards is imposed greater responsibility than on him who needs simply follow. Therefore, Dunham in every one of its many heating specialties has built to the original line of perfection. The proof is in thousands of perfectly heated buildings throughout the United States and Canada and in the growing use of Dunham Heating Service by architects and builders.

C. A. DUNHAM COMPANY

230 East Ohio Street, Chicago, Illinois

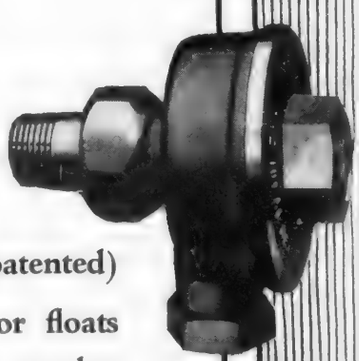
60 Branch and Local Sales Offices in the United States and Canada

VAPOR-VACUUM
STAY-RITE
SPECIALTIES



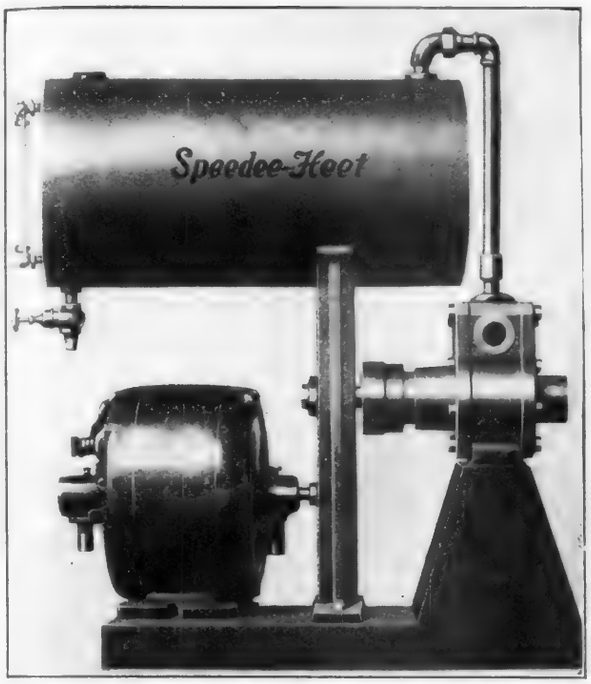
The only kind of Radiator Traps and Valves you can afford to recommend are those that bring more business.

Stay-Rite Traps are all-metal (patented)
They do not contain liquid, gas, solder or floats
They cannot rupture and will not corrode or clog



Write today for literature and prices

THE IDEAL HEATING EQUIPMENT CO.
1250 WEST 4TH ST.
CLEVELAND, OHIO



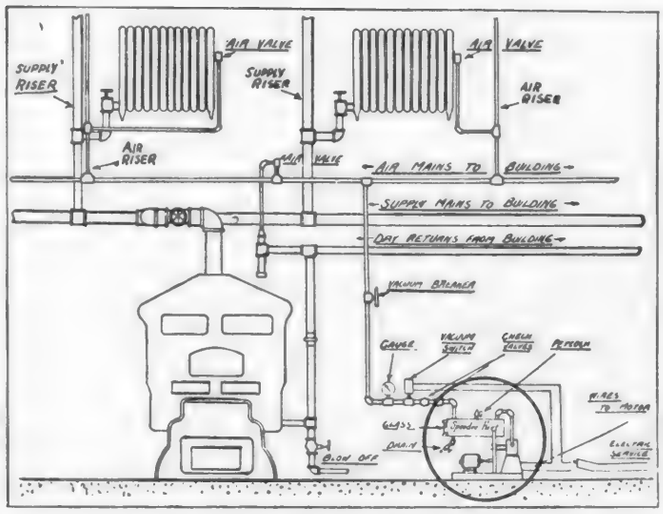
Positive Circulation

Absolutely Guaranteed with

SPEEDEE HEET

The Circulating Machine

It is easy to understand, easy to install, and so simple in operation that no operating trouble can ever arise to cause dissatisfaction on the part of the owner.



Method of installing LEBANON SPEEDEE-HEET with one-pipe steam heating system where water of condensation is returned to boiler direct.

The greatest obstacle of steam circulation is air in the radiation. This air must be eliminated before steam can be circulated, and the heat utilized.

Many efforts have been made to rid the radiation of air resistance effectively. Radiators distant from the boiler remain cold too long. Too much fuel is consumed without a consequent return of heat, and in fact the entire system is overtaxed to drive out the air, in order that steam might take its place.

There is but one efficient and economical method for ridding a heating system of air. That is the method of drawing it out by means of vacuum with our small electric driven SPEEDEE-HEET, which means instant suction in the lines, pulling steam below atmospheric to every inch of the radiation and leaves nothing to guess work or dependence on the laws of gravity for steam circulation.

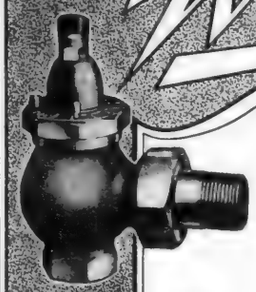
Write for Descriptive Literature and Prices.

Lebanon Machine Company, Inc.

Factory at **Lebanon, N. H.**

General Sales Office: **98 Park Place, New York City**
New England Office: **136 Federal St., Boston, Mass.**

The Webster



Systems of Steam Heating

In the planning of public buildings, such as the Municipal Pier at Baltimore shown above, the entire community takes an active interest and no efforts are spared to assure perfection in every detail.

In thousands of such buildings, as well as in buildings of every other type, Webster Systems of Steam Heating are selected without question because of their fully-proven worth and the completely satisfactory results invariably obtained.

To architects, engineers, contractors and owners, the selection of a Webster System of Steam Heating means far more than mechanically perfect apparatus. It also assures them of full and hearty co-operation throughout the planning, installing, and use of the equipment to help make each installation a permanent success and credit to all concerned. This co-operation is rendered through forty-one branch offices and service stations located in all parts of the country and by practical and experienced engineers well qualified to be of real assistance.

May we tell you more about Webster equipment and Webster Service? Write for full information.

Warren Webster & Company

Camden, N. J.

Branch Offices in 41 Cities

Canada: Darling Bros., Ltd.
Montreal

More than 17,000 installations

Radiator Trap SARCO

This wide opening permits *Free Discharge*

A full quarter-inch clearance between the valve seat and the conical valve. That's why the Radiator Trap Sarco discharges so freely. It provides an **ample** opening for the escape of the condensation.

If a radiator trap doesn't discharge freely it falls down in the performance of the very thing for which it was made. You'll find a vast difference between the performance of an ordinary trap and the Sarco in this respect. And in other respects, as well.

Just as it **opens freely,** so the diameter of the thermostatic element, together with the character of the volatile fluid used, insures **maximum closing pressure.**

This perfect functioning is earning for the Sarco, among engineers and heating experts, a reputation for reliable operation that should make it **your** choice for the trapping of steam, vacuum or vapor heating systems.

One more point in favor of the Sarco. Due to the **spiral** instead of **annular** corrugations of the thermostatic element, the wear is so distributed as to become negligible. The life of this part of the Sarco is greater by many times than the life of the corresponding part in other traps.

Made in ½" and ¾" sizes, with nickel finished brass bodies; in four types, angle, straightaway, and right and left offset.

A postcard brings our illustrated Booklet P-102.

SARCO CO., INC.

231 Broadway, New York City

Buffalo Chicago Cleveland
Boston Detroit Philadelphia

Sterlco
TRADE MARK

# Denotes Quality, Service and Reliability

Products bearing this trademark are manufactured by the Sterling Engineering Company of Milwaukee, Wisconsin.

A firm of seven years standing who started from a small beginning and who through strict adherence to the above principles have increased sales from 50% to 100% annually.

OUR PRODUCTS ARE OUR BEST ADVERTISEMENT

We Manufacture

Thermostatic Radiator Traps,
Packless Radiator Valves,
Air Line Valves,
Strainers,
Vapor Air Eliminators,
Return to Boiler Traps,
Vacuum Pumps,
Condensation Pumps and Receivers
Air Line Vacuum Pumps,
Temperature Controls.

STERLING ENGINEERING COMPANY

MILWAUKEE, WISCONSIN

NEW YORK OFFICE
50 Church Street.

DETROIT OFFICE
3000 Grand River Ave.

CLEVELAND OFFICE
326 Union Building

Representatives in all large cities.

ILLINOIS HEATING SYSTEMS

MAKE WARM FRIENDS

These results are only permanently possible with the

ILLINOIS HEAT RETAINER

—Browne Patent—

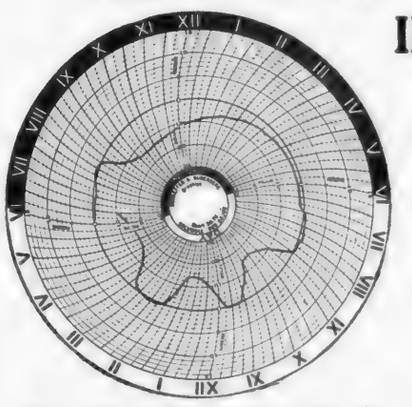
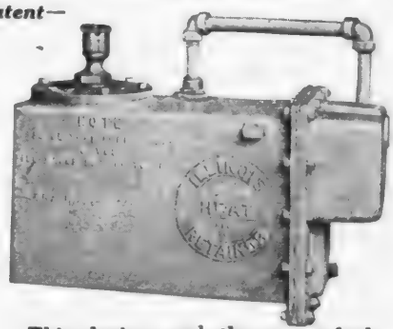


Chart shows 24 hour Record of Pressure and Vacuum on an Illinois Vapor System.

Nearly 20 hours out of the 24 without steam pressure yet radiation continuously hot.



This device, and the great fuel economy it effects, merits your attention.

Write for description

ILLINOIS ENGINEERING CO.

INCORPORATED 1900 — CHICAGO — REPRESENTATIVES IN 28 CITIES

NEW BETHLEHEM, HOTEL, BETHLEHEM, PA.
RITTER & SHAY, PHILADELPHIA, ARCHITECTS
HERSH BROTHERS, ALLENTOWN, PLUMBING CONTRACTORS

WHITLOCK HEATERS

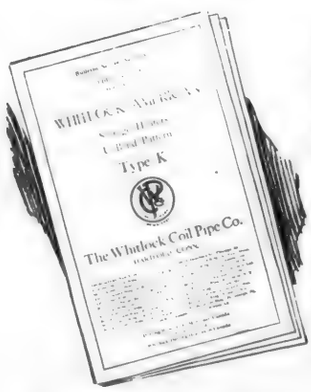
Supply the Hot Water in the New Hotel Bethlehem

In this new, modern, finely equipped hotel, two Whitlock Storage Heaters supply all of the service hot water. These heaters each have a storage capacity of 1000 gallons and a heating capacity of 2000 gallons per hour.

As is the case with so many important structures, Whitlock Heaters were chosen for this hotel because of their dependability, long life and low operating and upkeep costs.

May our engineers assist you in planning your your hot water equipment?

THE WHITLOCK COIL PIPE CO.
40 South Street, Hartford, Conn.
New York Chicago Boston Buffalo Philadelphia



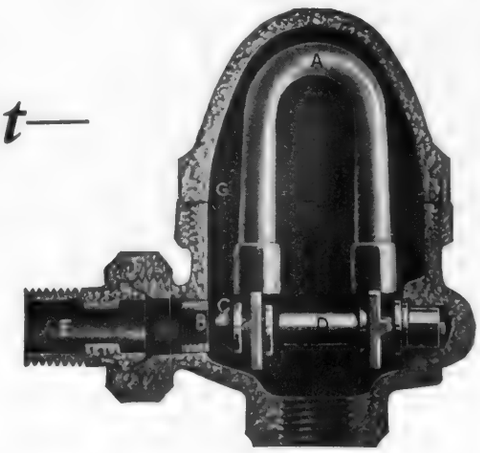
Send for Bulletin No. 40, just off the press. It contains useful information and tables which will prove valuable to you.

We announce the removal of our Boston office from 50 Congress Street to 514 Atlantic Avenue, and the appointment of Mr. C. L. Howes as New England representative.

WHITLOCK HEAT TRANSFER PRODUCTS

Built on the Old Reliable Principle

but—



Constructed Differently

An important factor to which we wish to call particular attention is that the

"VENTO" AUTOMATIC VALVE

is built on the old reliable principle that has placed our Haines Traps in a class by itself, and that its operating power is identical—the only difference being in general construction.

Valve Mechanism is mounted horizontally—long range of movement—positive action—quick opening and closing.

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

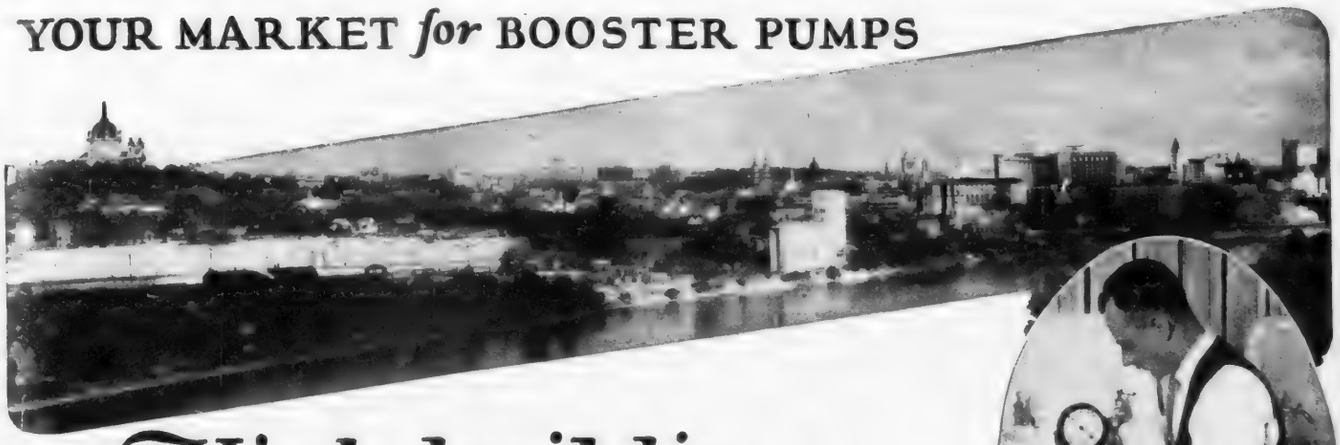
Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

VENTO

WILLIAM S. HAINES & CO.,
12th & Buttonwood Streets
PHILADELPHIA, PA.

YOUR MARKET *for* BOOSTER PUMPS



High buildings with Low pressure

There should be ten pounds water pressure at the highest faucet in a building. But often the pressure is down to about four pounds by the time it reaches the top floor. And when water is being used on the lower floors, there may not be even a drip at the faucets above. Which is why Booster Pumps are needed.

Use the table to the right and figure the prospects in your city. The table is approximate, of course, but it is a starting point. To check your prospect list all you need is a water pressure gauge.

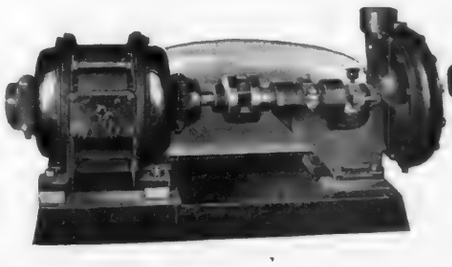
Of all the various pumps that are used in a building, the Booster Pump is simplest to install. Very little work, but plenty of profit.

If you wish to send us a list of Booster Pump prospects we will gladly help you interest them—mentioning your name in our follow-up.

Have you a Bulletin 2?

PROSPECT TABLE	
If this is your city water pressure	All buildings over this height are prospects
POUNDS	FEET
20	25
30	40
40	60
50	90
60	110
70	140
80	150

THE TRANE CO. 206 CAMERON **LA CROSSE, WIS.**

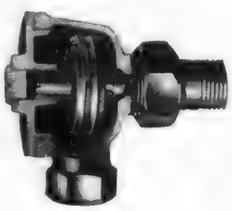


TRANE PUMPS

PECO

In this modern hotel building Peco equipment is used throughout.

By means of the Peco system steam is circulated through every foot of radiation at a pressure less than 6 ounces.



PENN
ALBERT
HOTEL
GREENSBURG, PA.

THERMO TRAP THE MOST DURABLE TRAP ON THE MARKET POSITIVE IN OPERATION AND NON-ADJUSTABLE.

PITTSBURGH ENGINEERING CO.

JEANNETTE, PA.

AGENTS WANTED **WRITE FOR LITERATURE**

VAPOR MOUAT HEAT

Roberts Hotel, Muncie, Ind.

Nicoll Scholer & Hoffman, Architect
Lafayette, Ind.

VAPOR MOUAT HEAT

Another modern hotel installs
MOUAT VAPOR HEAT

The test of any heating system is a hotel. Modern hotels with their complicated service demand that which is most simple and efficient.

That demand is met when Mouat Vapor Heat is installed—the heating system that has positive heat control in each room without the use of vacuum pumps, traps or thermostatic valves.

Only one-half to three ounces of pressure are necessary for operation

MOUAT VAPOR HEATING COMPANY

CLEVELAND, OHIO

SUCCESS —is a matter of direction—not position. It depends upon whether you are on the flood tide or the ebb

Victory for Unit System of Ventilation

"The controversy which has been waged for several years regarding the unit system of ventilation, whereby mechanical devices are omitted, has culminated in a definite action on the part of the New York school authorities. These have now come out decidedly in favor of the unit system.

At a conference attended by John A. Ferguson, M. D. Chairman of Committee on Buildings, Dr. Edward B. Shallow, Associate Superintendent of Schools, Amos Smith, Engineer, William H. Gompert, Architect, R. W. Rodman, Superintendent of Plant Operation, F. G. McCann, Chief of the Heating and Ventilating Bureau, and Messrs. Dobbin, Lindsay, Kiewitz and Thomas of the Bureau of Construction and maintenance, a thorough discussion of the subject was entered into. By a unanimous vote it was decided to adopt the unit system of heating and ventilation in future buildings.

Replies received from architects connected with the boards of education in various cities and also private practising architects who are experts on school buildings endorse the unit system of heating and ventilation."

(Reprinted from American School Board Journal, September, 1923.)

Ten years ago Unit Ventilation was considered an experiment. Today you are advised by your Trade Journals that it has been adopted as a standard by the largest city in the world.

Other important cities throughout the United States have done the same thing, and many more will do so as soon as they learn of its advantages.

If it is your ambition to attain success as a Sales Engineer, or Manager of Sales, the above facts and the news item to the left, will interest you.

No industry allied with heating and ventilating has made the progress in as short a space of time as Unit Ventilation and the surface has just been scratched—because—unit ventilation is better ventilation.

Sales Engineers Wanted

We are the manufacturers of the "Univent." We are pioneers in this field and the largest manufacturers in this line. (See our advertisement, page 19, in this issue.)

We desire to employ several Sales Engineers to open new territories and make certain changes in territories now covered.

We will consider applications from real, live, progressive men, who know and understand the fundamentals of heating and ventilating, whether or not they have a technical college education.

We want representatives who not only can sell to high grade Architects, Engineers, Contractors and Public Boards, but men who can also deliver high grade service, such as it is the policy of this company to render its clients, and upon which service its growth has been built.

We are willing to pay the price necessary to add such men to our staff and will guarantee a substantial salary and expenses to the right ones.

If you think you can qualify, we shall be glad to hear from you, with complete information regarding yourself and the territory you would prefer to work in.

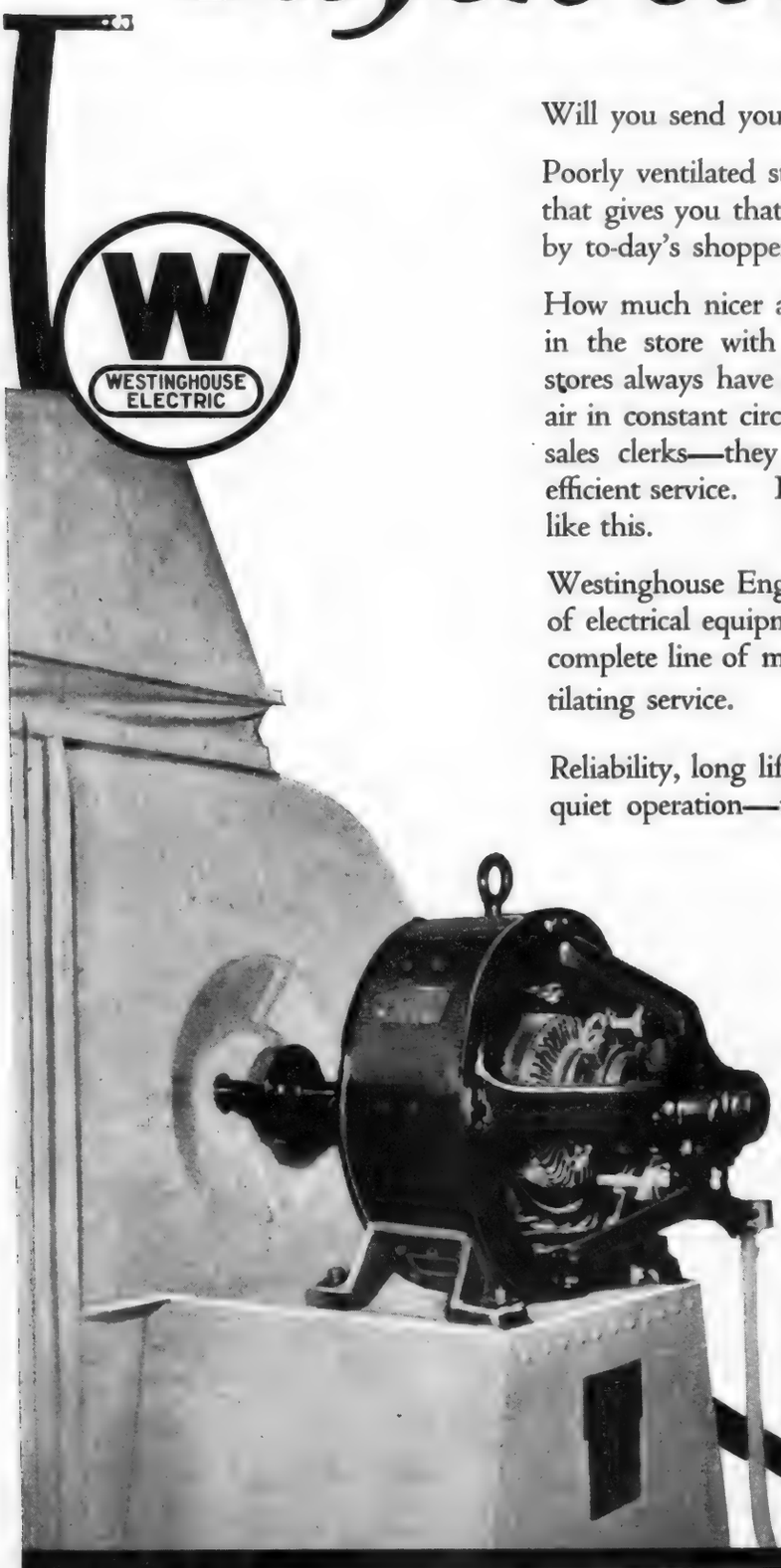
THE HERMAN NELSON CORPORATION *Moline, Ill.*

1910 Third Avenue

Branch Sales and Service Stations

BELFAST, ME.	PHILADELPHIA	CLEVELAND	MINNEAPOLIS	KANSAS CITY	PORTLAND
BOSTON	SCRANTON	COLUMBUS	CHICAGO	DENVER	SEATTLE
NEW YORK CITY	PITTSBURG	DES MOINES	ST. LOUIS	SALT LAKE CITY	SAN FRANCISCO
ROCHESTER	GRAND RAPIDS	MILWAUKEE	EMPORIA	SPOKANE	OMAHA

Buyers Seek The



Will you send your client's customers home with a headache?

Poorly ventilated stores, hot and stuffy with heavy foul air that gives you that "sick headachy" feeling are being avoided by to-day's shoppers.

How much nicer and more pleasant in every respect to shop in the store with a modern ventilation equipment! Such stores always have an abundance of fresh, cool, invigorating air in constant circulation. And notice the difference in the sales clerks—they are always alert and always give quick, efficient service. It is a pleasure indeed to patronize a store like this.

Westinghouse Engineers have made a thorough investigation of electrical equipment for ventilation and have designed a complete line of motors and controllers for heating and ventilating service.

Reliability, long life, sturdy construction, wide range of speed, quiet operation—these are only a few of the outstanding features and advantages of Westinghouse Equipment. Our engineers will be pleased at all times to render specialized counsel on your electrical problems for heating and ventilating service.

Westinghouse Electric & Manufacturing Co.

EAST PITTSBURGH, - PENNSYLVANIA

Sales Offices in All Principal Cities of the United States and Foreign Countries.

Westinghouse

Well Ventilated Store

Westinghouse

HERE IT IS!

A SINGLE PIPE VAPOR SYSTEM

Simple to Install

—Any steam fitter can put in this System

LOW IN COST

Does the Work

—We have the successful installations to prove it

Descriptive matter sent on request

GORTON & LIDGERWOOD CO.

96 Liberty Street

NEW YORK

FISHER BUILDING, CHICAGO, ILL.

Share Honeywell's National Reputation

The desirability and superiority of Honeywell Temperature Regulators are being skillfully impressed on the minds of millions of people through a great national advertising campaign.

Your recommendations to home owners on the fundamental advantages of automatically controlled heat—and the exclusive features of Honeywell Regulators, will carry greater import because of Honeywell's position as a national advertiser.

In short, share Honeywell's national reputation. Make this part of *your* assets and good-will. Recommending products, such as Honeywell, which enjoy the respect and confidence of the public builds up in the mind of your customers a confidence in you. And it pays profits.

Many heating men find that carrying a supply of Honeywell literature, leaving some with their customers on every opportunity, has been the means of increasing their sales in a marked degree. It completes the tie-up between them and the big Honeywell advertisements.

Learn more about the Honeywell line. Let us send you complete details about the products and our sales plan which is creating a source of new business and more profits for heating men everywhere.

The Honeywell Specialties Company
Wabash, Indiana

HONEYWELL
Temperature Regulators

ALLEN AIR-TURBINE VENTILATOR

The Acknowledged Most Efficient Ventilator Produced

Wherever ventilation is desired—in factories, foundries, stores, schools, hotels, churches theatres, residences, kitchens, bakeries, tanneries, barns, stables, garages, chimneys, air shafts, or wherever air circulation is required, Allen Air-Turbines have proven the best, cheapest and most efficient ventilating system known.

The Allen Air-Turbine is a true rotating air-driven suction turbine. It pulls air up and discharges it "through the roof." It works AUTOMATICALLY, CONSTANTLY, *SILENTLY*—day and night, week days, Sundays, Holidays.

NO OPERATING EXPENSE

The first cost of an Allen Air-Turbine Ventilator is the final cost. There is no operating expense. Once installed it requires no attention—no care—no adjusting.

EFFICIENCY GUARANTEED

There's no guess-work. no question, no doubt as to its efficiency. Its ability to displace is positive, constant, dependable, measureable and guaranteed.

WORKS IN ALL WEATHER

Allen Air-Turbine Ventilators operate under all weather conditions. unhampered and unaffected by snow, ice, sleet or rain. THEY ARE POSITIVELY LEAK PROOF.

NO DOWN DRAFT

The powerful upward suction force of the rotating turbine make down drafts in the Allen Air-Turbine Ventilator a mechanical construction impossibility.

CHEAPEST—BEST

Allen Air-Turbine Ventilators provide the cheapest, best and most efficient method of obtaining positive and practical ventilation known—combining all the merits of power driven systems but without the heavy initial cost and continuous operating expense, care and upkeep.

WRITE FOR DETAILED LITERATURE

ALLEN AIR-TURBINE VENTILATOR CO.

DETROIT Eighth & Porter Sts. MICHIGAN.

Patented

CARRIES OFF
GASES
MOISTURE
STEAM
SMOKE
VAPOR
FOUL AIR
ODORS
HEAT
FUMES
DUST
DAMPNESS

TWINFAN Unit Heaters —Ideal For Garages

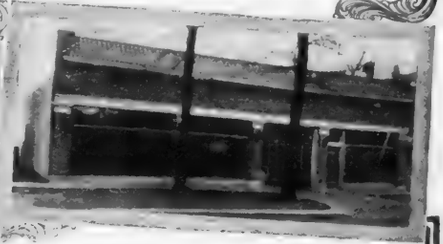
TWINFAN SYSTEM OF HEATING

Simplest and Most Satisfactory System of Steam Heating

Send for Bulletin on Public Garage Heating

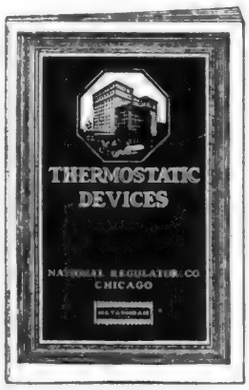
Units are placed in out of the way spaces.
Here shown set on concrete bumper curb.

Typical installation showing two TWINFAN units heating a one hundred car garage. The heat is uniformly distributed and prevented from accumulating at the roof.



SHOREEN SERVICE STA., EVANSTON, ILL. WEST TOWN GARAGE. CHICAGO HEBBLETHWAITE GARAGE, EVANSTON

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.



The booklet "Thermostatic Devices," shown above, for which many engineers have sent, is available to you upon request. It is clearly illustrated and contains data and facts of the simplicity of the National System for the control of Temperature.

TRADE METAPHRAM MARK REG U S PAT OFFICE

Announcement—

Owing to our rapidly growing business we are forced to larger quarters, and shortly after January 1st, 1924 we will be located in our new factory at the corner of Knox and Belden Avenues, Chicago, Illinois, where we will be in much better position to handle, even more promptly, our customers' requirements for Temperature Regulating Apparatus, High and Low Pressure Steam Damper Regulators, as well as Automatic Temperature Controlling Apparatus for all types of Industrial processes.

Write for new catalogs, if you have not already received them.

NATIONAL REGULATOR CO.
208 So. Jefferson St. CHICAGO, ILL.

Offices in principal cities

Martin Tullgren & Co. Archts.

Hotel Astor

Wenzel & Henoch Htg. Cont.

THE McALEAR MFG. Co., Chicago.

Hotel Astor
Astor St. & Juneau Ave.
MILWAUKEE

June 29, 1922

McAlear, Mfg. Co.
Chicago, Ill.
Sirs:

The McAlear *valves* and *traps* have been in operation in the Hotel Astor for several seasons and have proven entirely satisfactory.

We are glad to recommend *McAlear specialties* and through their operation in this building have *selected* them for the *Hotel Retlaw. Fond du Lac, Wis.*

Very truly yours,

Hotel Astor
J. A. DOTSCH
Chief Engineer

Announcement

WE believe that Engineers engaged in or associated with the science of Heating and Ventilation will be interested in a series of educational and informative advertisements, one to appear each month on this page during the year of 1924.

The series will comprise interesting experiments in test work, the solution of more or less difficult or unusual ventilation problems, experimental data, reports, etc., that will, we feel, be of interest and value to those engaged in this interesting field, with perhaps incidental references to the methods employed in aerological test work and the instruments we manufacture.

The first of the series will appear in the January number

E. VERNON HILL CO.
Aerologists
64 West Randolph Street
CHICAGO

ELECTROZONE VENTILATION

Ivanhoe Masonic Temple, Kansas City, Mo.
Chas. A. Smith, Architect

SOLVING HEATING AND VENTILATING PROBLEMS

In the new Ivanhoe Masonic Temple, at Kansas City, Electrozone ventilating equipment maintains a constant supply of fresh, pure air, effecting, at the same time, an appreciable saving in fuel.

Modern buildings of all types - - schools, factories and office buildings - - are being fitted with Electrozone ventilating equipment - - the equipment that fully measures up to present day requirements.

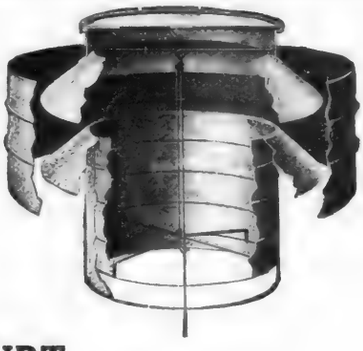
Heating and ventilating engineers will find our engineering staff always ready to co-operate with them in working out heating and ventilating problems.

THE AIR CONDITIONING AND ENGINEERING CO.

Air Conditioning and Ventilation Apparatus

2914 SOUTH JEFFERSON AVENUE, SAINT LOUIS

BURT



BURT

GLASS TOP VENTILATORS ARE COMBINATION SKYLIGHTS AND VENTILATORS

The glass top is a feature which makes the Burt Glass Top Ventilators of great value where maximum light is a big factor. No matter how much or how little ventilation is desired, the light is never obstructed, due to our patented Sliding Sleeve Damper.

Write for Catalog

Made and Guaranteed by

The Burt Manufacturing Co.

Largest Manufacturers of Oil Filters in the World

262 Main Street, AKRON, OHIO

Satisfactory Heating Depends on Control of Air Infiltration

A Problem That Belongs to the Heating Engineer

Shrinkage between the sash and frame around windows and doors usually begins as soon as the heating plant is put in operation. Unless this condition is offset by the selection of the right type and style of weather strips, cold air leaks in, heat leaks out, the efficiency of the heating installation is lessened and its cost of operation mounts high.

Thus satisfactory heating depends on the control of air infiltration—an engineering problem which belongs to the heating engineer. Concerned primarily with satisfactory heating at the lowest possible cost for radiation, he brings to bear the latest data developed by research to design his work.

We are recommending that architects omit weather strips from the general specifications and put the control of air infiltration where it belongs—in the hands of the heating engineer.

Send for our "Table of b. t. u. losses through air infiltration around windows and doors."

MONARCH METAL PRODUCTS CO.

5060 Penrose St., ST. LOUIS, Mo.

MONARCH
METAL WEATHER STRIPS

Standard Control of Air Infiltration

Cycloidal
MULTIVANE FANS
TRADE MARK

FULFILL THE OBLIGATIONS OF ENGINEERS AND CONTRACTORS TO THE USER.

A GENUINE COMBINATION OF

EFFICIENCY *AND* DURABILITY

The result of over 40 years of constant experience

Pat'd May 26, 1908

A fact that demands your attention:—

"WHEREVER INSTALLED"

Cycloidal Multivane Fans Receive Unsolicited Praise and Recommendation from Architects, Engineers, Contractors and Users.

Our new catalog No. 200, which is just out, should be on your desk. Let us send you one.

GARDEN CITY FAN CO.

Established 1870

McCormick Bld. CHICAGO, ILL.

COCHRAN & WRIGHTSON
47 W. 34th St.
New York City

35 years have proved it's value to Central Heating Stations

Automatic temperature control of district steam heat with the Minneapolis Heat Regulator is an improvement welcome both to Central Station Companies and to their patrons. It makes satisfied customers by insuring more comfortable heating and preventing waste by condensation. Thus it increases the saleability of district steam service.

The enormous waste in hand control is proved by investigation which show that with "Minneapolis" control the valves are closed 60% of the time in weather as cold as 8° above zero. Where a flat rate applies this saving is enjoyed by the company immediately upon installing the "Minneapolis." Thus the company not only saves money but increases the field of operations possible with a given plant equipment. Where a unit rate applies, the customers' heat bills are reduced and the company's capacity enlarged in proportion.

Central Station companies whose equipment had lost efficiency through wear and tear have found that "Minneapolis" control made up for as much as five years' depreciation losses.

Easily Installed—Simple in Operation

It is not necessary to make any changes in piping or heating system construction. The "Minneapolis" can be installed on any kind of district heating equipment, new or old. No delicate thermostatic valves, no special air pressure necessary, no diaphragms to replace or traps to clean. Minneapolis Heat Regulators are nationally advertised in leading publications. The public accepts them as the last word in modern convenience in a heating system.

Write to our District Steam Department for detailed explanation of how "Minneapolis" automatic temperature control can be applied to district heating systems, stating your particular problem. No charge will be made for this consultation service.

MINNEAPOLIS HEAT REGULATOR CO.

2804 4th. Avenue, So., MINNEAPOLIS, Minn.

The "MINNEAPOLIS" HEAT REGULATOR

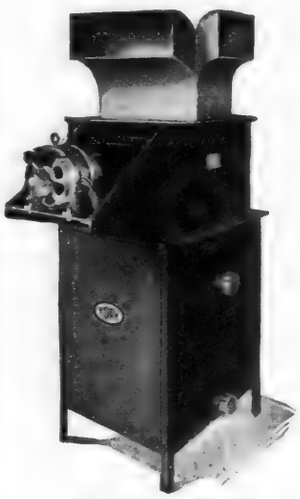
The Heart of the Heating Plant

ENGINEERED YORK PRODUCTS

Leaking joints eliminated in

YORK UNIT HEATERS

"the pipe coils are WELDED"



York Unit Heater
Motor Driven Type.

BALL BEARING FAN with dustproof, self-aligning bearings outside the fan housing, (not in contact with hot air.)

FAN may be belted to line shaft or motor, or directly coupled to motor.

UNIT stands on legs, no special foundation is required. It can be furnished for ceiling suspension when desired.

Nine sizes for vacuum, low pressure or high pressure steam systems.

WRITE FOR CATALOG

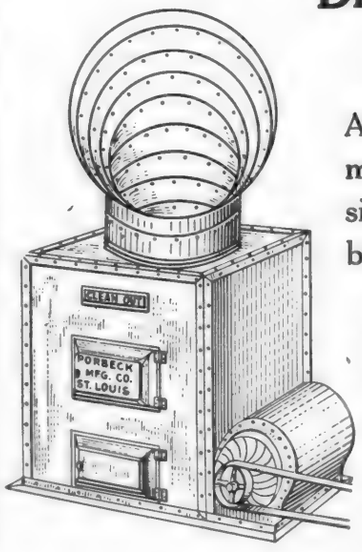
YORK HEATING & VENTILATING CORP.
Locust at 15th Street, Philadelphia

By appearance and satisfactory performance have Massachusetts Squirrel Cage Fans merited their continued use in buildings of all classes.

MASSACHUSETTS BLOWER CO.
FACTORY:
WATERTOWN, MASS.
Principal sales office: Grand Central Terminal, New York City.
Branch Offices in Principal Cities

The PORBECK

Direct Fired Heater



Also furnished in multiples for any size or kind of building.

The Porbeck direct fired heater is adapted to heating and ventilating large and small buildings. Eliminates need for distributing pipes and provides an even distribution of warm air throughout the largest of buildings. Send for descriptive matter.

PORBECK MANUFACTURING COMPANY
1000 North Market Street
St. Louis, Mo.

ADSCO

Ask for Folder No. A-53-H, Adsco Heating for individual buildings; Bulletin No. 20-H Adsco Community Heating of building groups from central steam plant.

AMERICAN DISTRICT STEAM COMPANY
MEMBERS THE NATIONAL TRADE EXTENSION BUREAU PLUMBING AND HEATING INDUSTRY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
OFFICES
New York Chicago Seattle

HEATING

Heating and Ventilation
STANDARD DATA SHEETS

SOME SUBJECTS

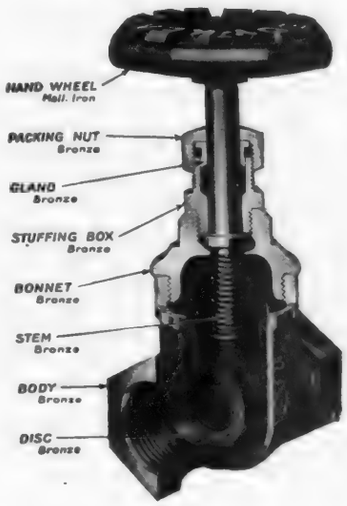
B. T. U. Losses
Ducts and Flues
Chimneys
Fittings
Pipe Covering
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

252 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and folder

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

KENNEDY



Built for Service

Ample passageway, accurate machining, generous proportions, carefully selected and tested materials—these are some of the factors that assure permanent satisfaction with Kennedy Valves.

The valves without a comeback

"Whenever we do absolutely first class work, in either steam or water, our standard is 'Kennedy'." .This statement, made by an able contractor, is the result of many years' experience with Kennedy Valves. On your jobs they would assure the same satisfaction to your clients.

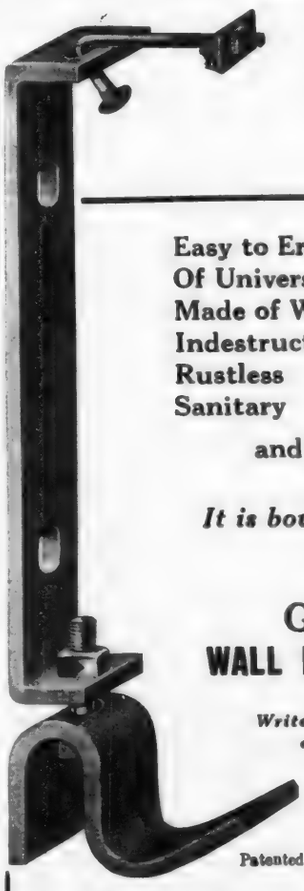
The entire Kennedy line, including over 500 different types and sizes, is described and listed in the Kennedy Catalog. Send for a copy and select a few Kennedy Valves for trial on your next job.

THE KENNEDY VALVE MFG. CO.

MEMBERS THE NATIONAL TRADE EXTENSION BUREAU OF THE PLUMBING AND HEATING INDUSTRY. PERMIT N° 70 REGISTERED.

Branches—NEW YORK CITY: 95 John St.
CHICAGO: 228 N. Jefferson St.
BOSTON: 47 India St.
SAN FRANCISCO: 23-25 Minna St.

Sales Offices—SEATTLE: L. C. Smith Bldg.
SALT LAKE CITY: 502 Dooley Bldg.
EL PASO: 704 Two Republics Bldg.



When a Bracket is

Easy to Erect
Of Universal Adjustment
Made of Wrought Iron
Indestructible
Rustless
Sanitary

and will fit any make wall radiator

It is bound to be Economical and Ideal

SUCH IS THE

GLEOCKLE
WALL RADIATOR BRACKET

Write for Descriptive Booklet and Trade Discounts

Prompt Shipments

Patented A. F. GLEOCKLE, Jr.
415 Bay St., Rochester, N. Y.

Specifying "Gleockle" Brackets is one way of saving your client money

Capitol Products Always Satisfy

Keeping Pace -

There are no "back numbers" in the "Capitol" line. We are constantly keeping pace with modern progress, and many of the items we manufacture are of our own advanced design and protected by patents. In buying "Capitol" products you are not only assured of highest quality, but are also sure of getting the latest designs and improvements.

FULL LINE OF GATE VALVES

Style illustrated is our No. 210 Non-Rising Stem Gate Valve. This is but one item in a large variety of valves we manufacture for Steam and Water service. We also make a full line of Plumbers' Brass Goods as well as Boiler Trimmings. Send for our Catalog No. 12 showing our complete lines.

No. 210

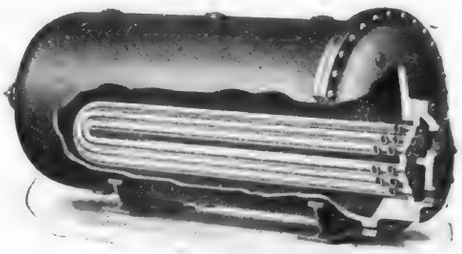
Capitol Brass Works - Detroit, Mich.

ask the Contractor

He installs **National Storage Heater** because the first cost is right—the maintenance low and the service reliable.

For a continuous or intermittent supply of hot water using either live or exhaust steam nothing beats a National for economy.

Bulletin 54 will be of interest when considering your Storage Heater Installations. Write for it.



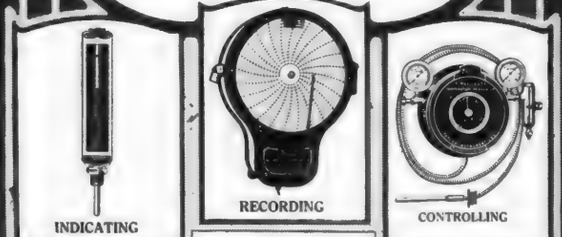
NATIONAL
U BEND TYPE
STORAGE HEATERS

The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN.

5801

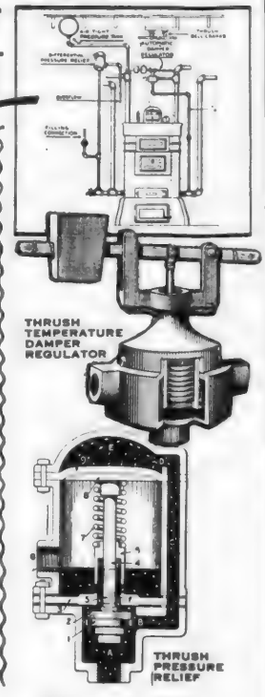
Tycos
temperature
instruments



effect economy in heating and ventilating through *Tycos* Temperature Controls. Factory Humidity records furnished by *Tycos* Wet and Dry Bulb Recorders. Humidity control also possible with *Tycos*. Write for details and literature.

Taylor Instrument Companies
ROCHESTER N.Y. 858
There's a Tycos or Taylor Temperature Instrument for Every Purpose

The THRUSH Heating Specialties that bring the Business



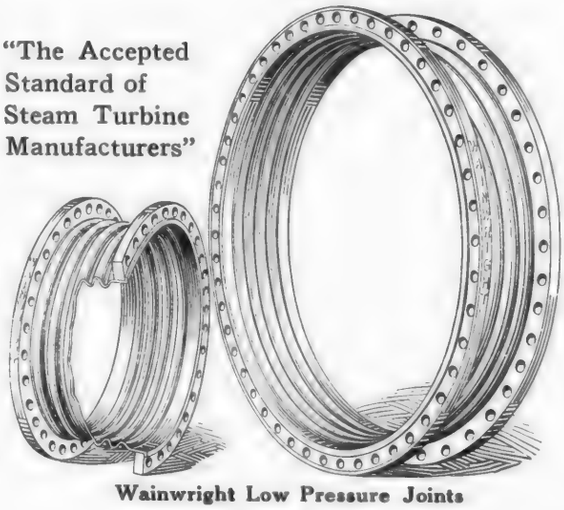
Your customers are interested in more comfortable and evenly heated homes. Every home owner with a hot water heating plant that is not working properly, will thank you for selling him the THRUSH System of Temperature Regulation. Every man building a new home will be glad to know about it when installing a heating plant. Because the THRUSH System fills the real need, it is proving to be a big business getter for the plumbers and steam fitters who handle it.

Write today for full information and an illustrated catalog

H. A. Thrush & Co.
PERU
INDIANA

Buy Flexibility When You Purchase Expansion Joints?

"The Accepted Standard of Steam Turbine Manufacturers"



Wainwright Low Pressure Joints

Four corrugations of perfect workmanship offer satisfactory service when single, two or three corrugations admit price competition only.

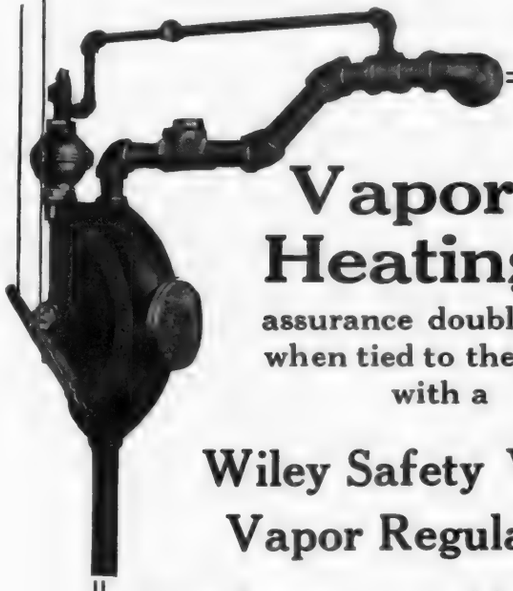
Our designs include both circular expansion joints for low pressure installation and circular reinforced patterns for high pressure work.

We offer a complete line of all sizes of corrugated copper low pressure expansion joints. Careful selection of material for this severe duty and expert workmanship guarantee proper service.

ALBERGER PUMP & CONDENSER COMPANY

140 Cedar Street, New York

Boston Chicago St. Louis Kansas City Philadelphia



Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co., Inc.

Lynchburg, Va.

Convert Any Furnace Into An Oil Burner

If your problem is the heating of a large or small home, apartment house, hotel, hospital, theatre, church or factory, investigate the

ROTARY OIL BURNER

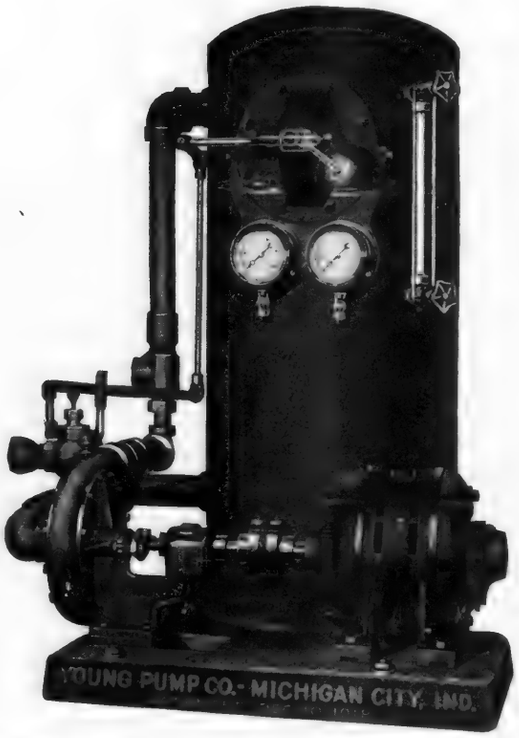
which can be quickly installed in any furnace—hot water, hot air or steam. The Rotary is THE oil burner that has given satisfactory service for 15 years, and is approved by Fire Marshals everywhere.

Safe, odorless, dustless, noiseless. Runs by simple water motor which won't get out of order. Eliminates annoyance, dirt and expense of ashes, and conserves space!

Write for full information.

Pennsylvania Globe Rotary Oil Burner Company

1934 Market Street., Philadelphia



They Come This Way!

JUST as you see the "YVM" outfit in the above illustration—that is the way the Young Centrifugal Vacuum and Boiler Feed Outfits are shipped. *Complete in every detail!* When received on the job, it is only necessary to make pipe connection to the system and boiler and wire connection to the motor. Then all is ready for operation.

The "YVM" is the simplest outfit made. There are no valves, springs or other parts that require adjustment, wear out or cause repair expense. It has a very low maintenance cost—in fact, the outfit is *economical in every way.*

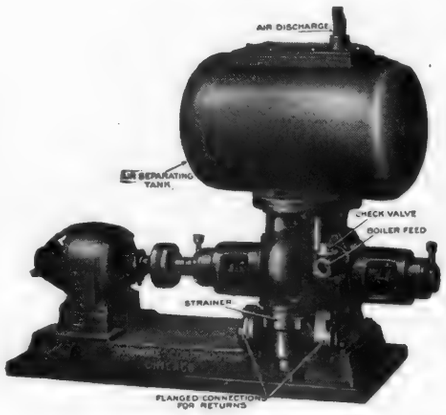
Made in six sizes to handle 4,000, 8,000, 16,000, 26,000, 40,000 or 65,000 sq. ft. of radiation; for continious operation or automatic control, to meet any condition or pressure.

Young Pump Company

Michigan City **Indiana**

Chicago Office. 327 S. Lasalle St.

SKIDMORE HYDRO TURBINE VACUUM AND BOILER FEED PUMP



SET THEM AS THEY COME CONNECT RETURNS, WIRE MOTOR AND RUN

Operates on a different principle.

Simple, Efficient and Sure.

Manufactured of highest grade material along lines of best engineering practice.

All parts are accurately machined.

The base, casing, bearing brackets and tank are fine-grained cast iron.

The shaft is Tobin Bronze carried on heavy ball bearings

The air rotor and centrifugal pump are bronze castings.

The Skidmore occupies half the floor space required for other makes of pumps.

A self-contained unit requiring no piping.

Engineers requiring the best and wanting a pump, the high efficiency of which remains constant, should specify the Skidmore.

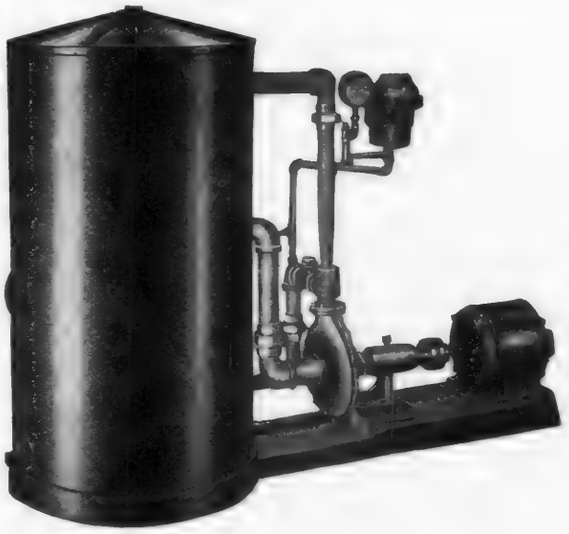
Bulletin No. 2 will be sent on request.

Built in five sizes for 10 and 20 lbs. pressure to handle 8000, 16000, 26000, 40000, and 65000 sq. ft. of radiation, for continuous service or with automatic control.

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. **CHICAGO, U. S. A.**



Shipped Completely Assembled, as shown

CONDENSATION VACUUM
Hydro PUMPS

DESERVE IMMEDIATE INVESTIGATION

Because—

—they are most economical.
—they are simple in construction.
—they are compactly built, occupy less space and are only one-half the weight of any other vacuum pump.
—they are a combination of an automatically controlled centrifugal water pump and vacuum pump impeller in one.
—they maintain proper vacuum at all times.
—they are "on the job" day and night, without watching.
—they have fewer working parts.
—they are built and shipped in one single unit.

Altogether, you cannot go wrong in specifying or using Hydro Condensation Vacuum Pumps. A heating system represents a large investment and deserves fair treatment. Hydro Pumps will insure you constant 100% efficiency.

Write at once for full particulars

The Hydro-High Vacuum Pump Co
INCORPORATED

"A size for every requirement"

Newport, Kentucky

By Repute "Always" Reliable

Mason Reducing Valves have an extraordinary reputation for three things—long life, continuous service and reliability, which is, after all, only a natural tribute earned through merit.

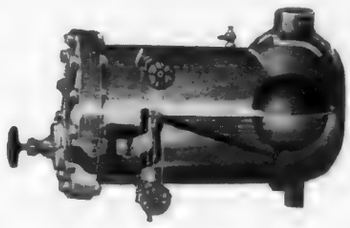
MASON REDUCING VALVES

are made in many types and sizes, and every type and every size can be depended upon to reduce and maintain pressure at the proper delivery point, regardless of the fluctuation in the initial pressure

To make your assurance doubly sure, Mason service is never separated from Mason products.

If pressure regulation problems trouble you, make use of our service.

MASON REGULATOR COMPANY
Boston, Mass. San Francisco, Cal. Montreal, Canada



THE BEST STEAM TRAP FOR HEATING SYSTEMS

Dry steam is essential to heating systems if operation is to be economical. But dry steam is impossible if the steam lines contain water of condensation.

The Davis Steam Trap automatically keeps steam lines free of condensation—without loss of steam. Service is reliable; they have cone-shaped balanced valves that give unusually large capacity and that will not stick or clog; valves and seats are renewable—made of special bronze, noncorrosive and extra hard.

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STEAM SAVERS SINCE 1875
SPECIALTIES

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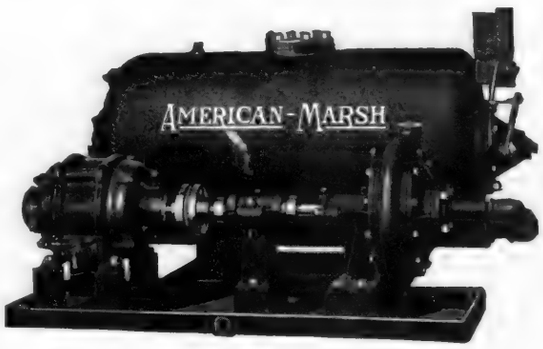
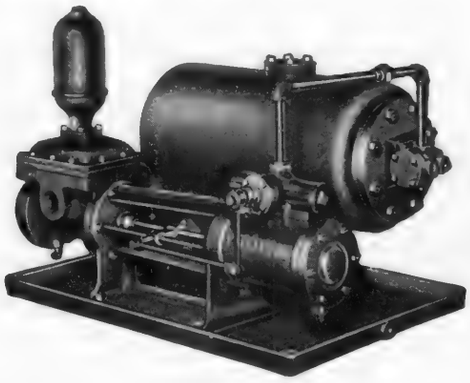
Direct Acting and Centrifugal





American-Marsh Condensation Pumps are the result of over thirty-five years experience in the manufacture of high grade pumps for heating systems. They are built in the motor driven centrifugal type in both horizontal and vertical patterns, the vertical type being intended for use where the returns are laid on or under the basement floor.

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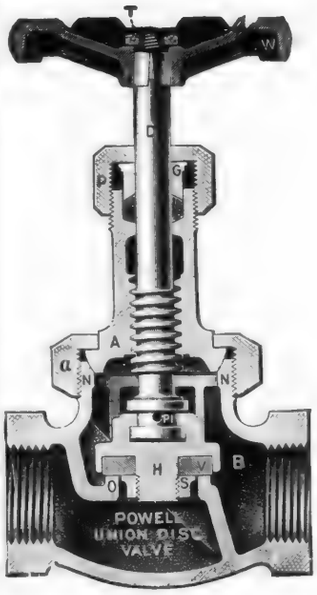

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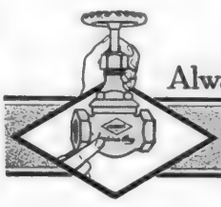

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a High Quality Product at a Low Price

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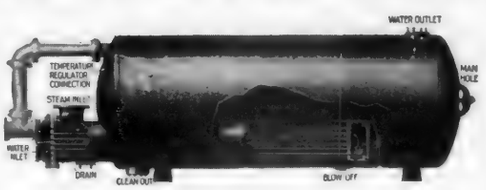

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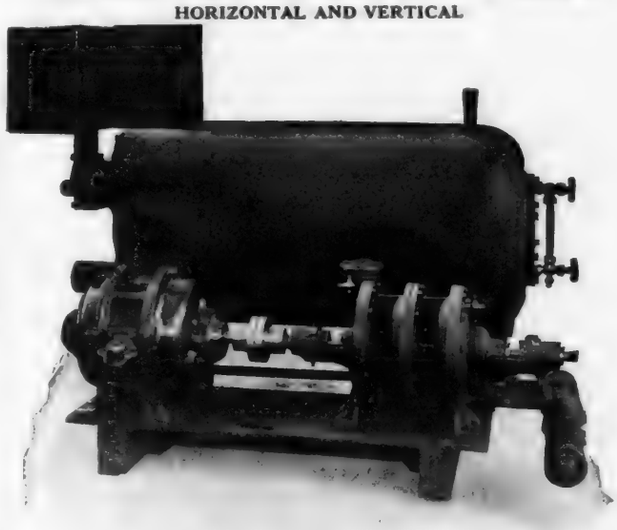

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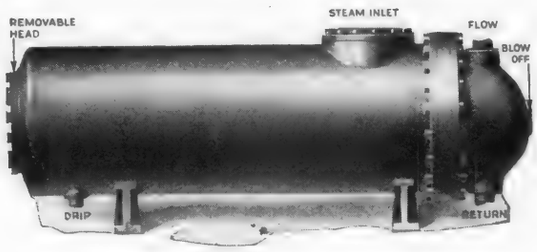

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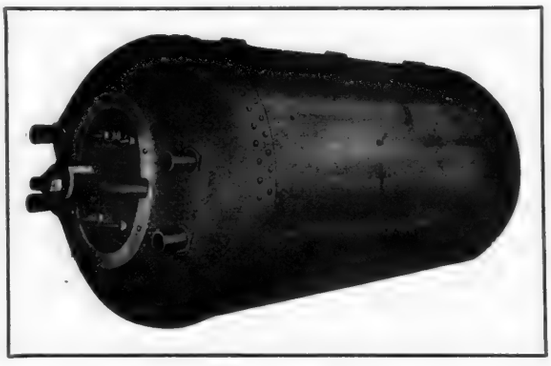

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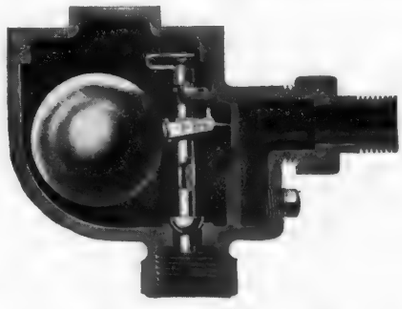

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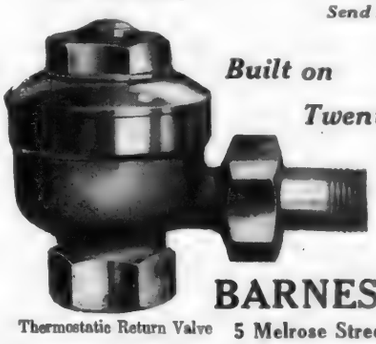

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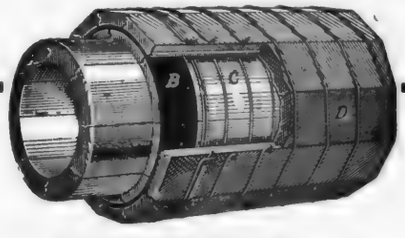

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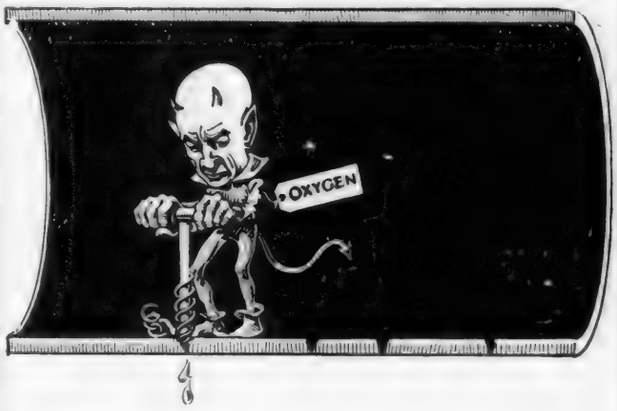

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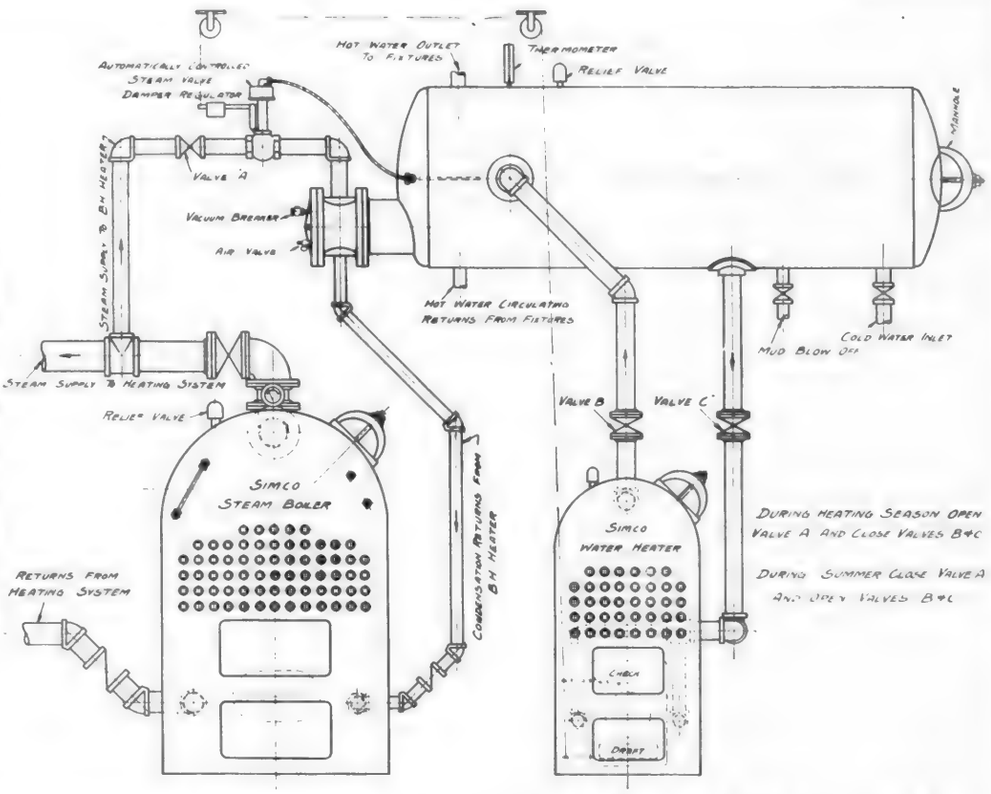

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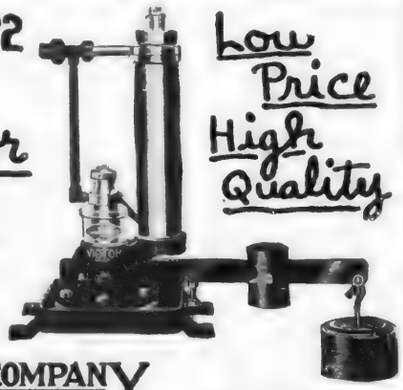

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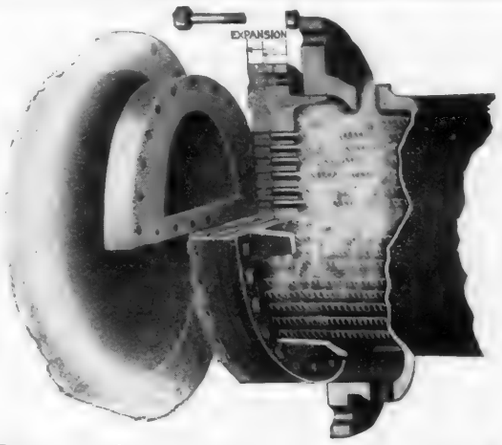

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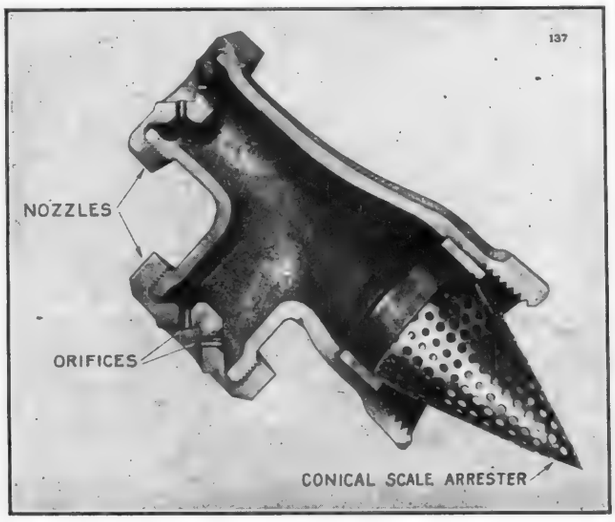

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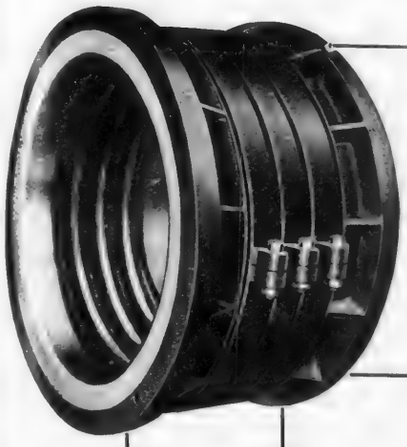

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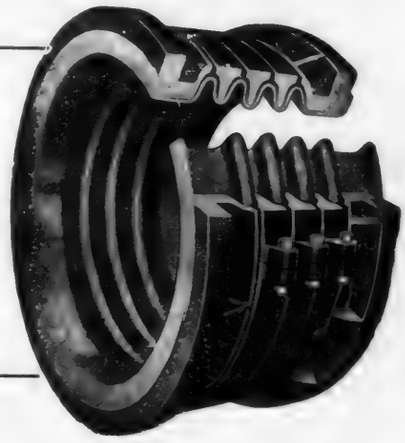

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Reed Air Filter Co., Inc., Louisville, Ky.

AIR SEPARATORS.

Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS.

Fan.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Porbeck Mfg. Co., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Pressure.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BOILER ALARMS.

Low Water.

Reliance Gauge Column Co., Cleveland, Ohio.

BOILER CEMENT.

Shur-Tite Mfg. Co., Norwood, Cinn., O.

BOILERS.

Down-Draft.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.

Heating.

Advance Boiler Corp., New York.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukeegan, Ill.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Heggie Simplex Boiler Co., Joliet, Ill.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Titusville Iron Works, Titusville, Pa.
Utica Heater Co., Utica, N. Y.

Power.

Hgegie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

COILS, PIPE.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Simmons Co., John, New York.

Air.

New York Blower Co., Chicago, Ill.

COOLERS.

Oil.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

COOLING TOWERS.

Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., Inc., New York.

CONDENSERS.

Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, HOT WATER.

Alberger Heater Co., Buffalo, N. Y.
Patterson-Kelley Co., New York.
Wyckoff & Son Co., A., Elmira, N. Y.

COVERING, PIPE.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Cooling Tower Co., Inc., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.

DRYING SYSTEMS.

(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

DUST COLLECTORS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.

ENGINES.

Steam, Automatic.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.

Hoffman Specialty Co., New York.

EXHAUST SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

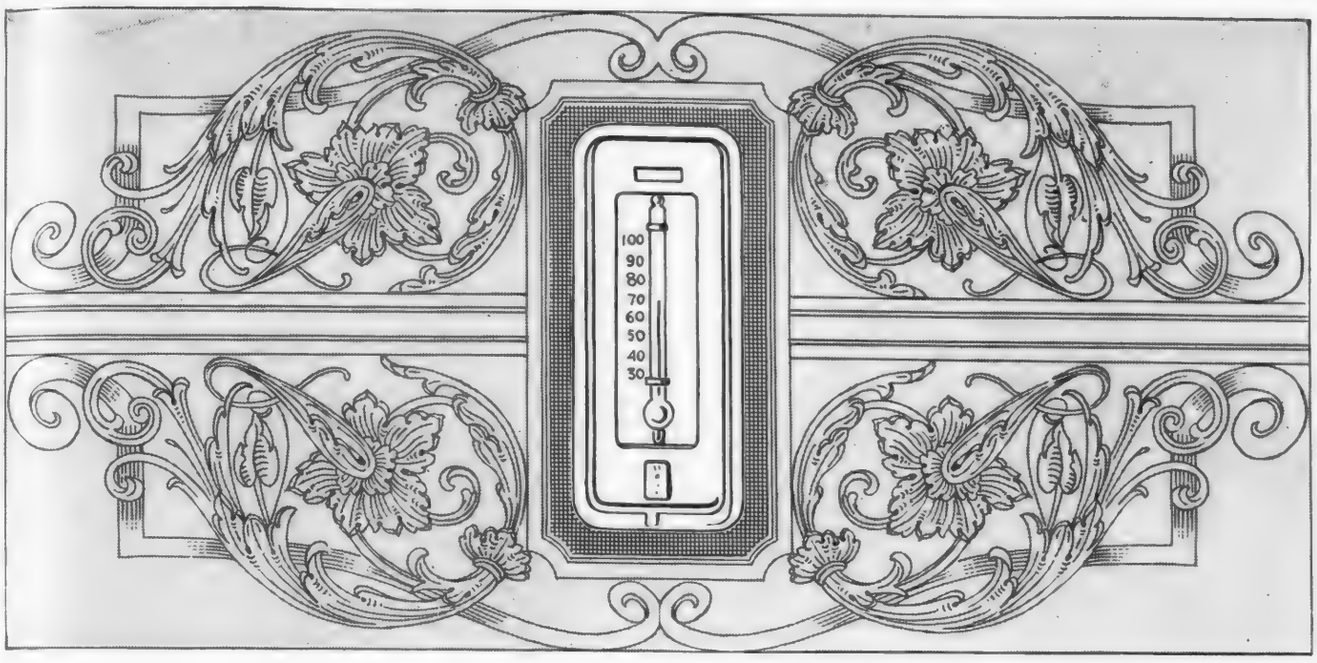
EVAPORATORS.

Boiler Feed Make-Up.

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.

EXHAUST HEADS.

Burt Mfg. Co., Akron, O.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Simmons Co., John, New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Wright-Austin Co., Detroit, Mich.



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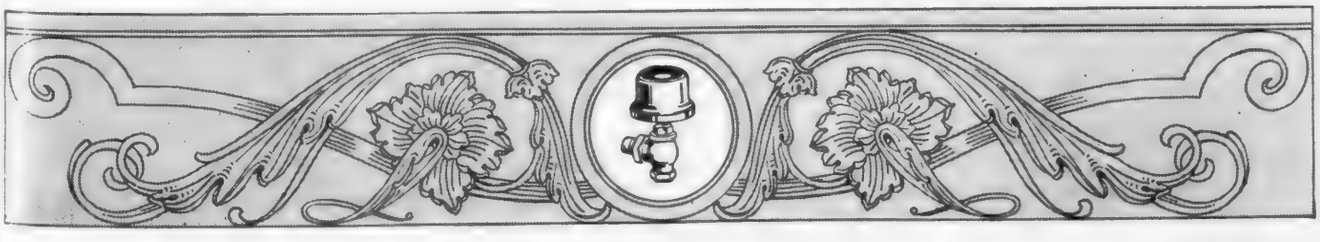
26 BRANCHES — UNITED STATES AND CANADA



ENGINEERS' SPECIFICATION INDEX (Continued)

EXPANSION JOINTS.

Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Pittsburgh Engineering Co., Jeanette, Pa.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

FANS, EXHAUST.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FILTERS, (Aerating).

Griscom-Russell Co., New York.

Feed-Water.

Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.

American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Pittsburgh Engineering Co., Jeanette, Pa.
Simmons Co., John, New York.

FLANGES.

American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Pittsburgh Engineering Co., Jeanette, Pa.

GASKETS, METALLIC.

Sarco Co., New York.

GAUGE BOARDS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Pittsburgh Engineering Co., Jeanette, Pa.
Taylor Instrument Cos., Rochester, N. Y.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES.

Altitude.

Pierce, Butler & Pierce Corp., New York.

Draft.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

Hydraulic.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

Ounce Graduated.

Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Pittsburgh Engineering Co., Jeanette, Pa.

Pressure.

American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pittsburgh Engineering Co., Jeanette, Pa.
Reliance Gauge Column Co., Cleveland, Ohio.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

Vacuum.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pittsburgh Engineering Co., Jeanette, Pa.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Taylor Instrument Cos., Rochester, N. Y.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).

Pierce, Butler & Pierce Corp., New York.

Water.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Capitol Brass Works, Detroit, Mich.
Jenkins Bros., New York.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

GENERATOR COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., Inc., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

GENERATORS, (Heat.)

Honeywell Heating Specialties Co., Wabash, Ind.

GOVERNORS, (Pump).

Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

HEATERS.

Domestic Water.

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Dahlquist Mfg. Co., Boston, Mass.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.

Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Michigan.
Griscom-Russell Co., New York.

Pipe, Coil (Air).

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Water.

Thrush Co., A. A., Peru, Ind.

HUMIDIFIERS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corporation, Newark, N. J.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.

American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.

INSTRUMENTS.

Electric Measuring.

Bristol Co., Waterbury, Conn.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Indicating and Recording.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Hill, E. Vernon Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division Brooklyn, N. Y.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Schaeffer & Budenberg Mfg. Co., and American Steam Gauge & Valve Mfg. Co., Division Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda N. Y.
Hornung, J. C., Chicago, Ill.

Feed Water.

Simmons Co., John, 110 Center St., New York.

Feed Water (Weir Type).

Webster & Co., Warren, Camden, N. J.

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To the Left: Macy Building, New York City, tallest department store in the world. Roof over laundry insulated with 1½" Lith.

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Roofing Contractor: Tuttle Roofing Co., 522 East 20th Street, New York City.

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Cleveland	Kansas City	Omaha		

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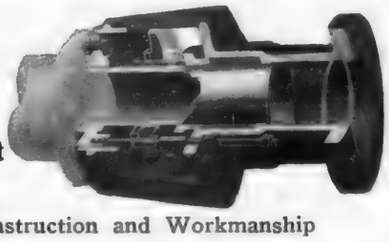

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PHILADELPHIA

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AUSTIN

DETROIT, MICHIGAN

GURNEY BOILERS RADIATORS

FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER

GURNEY HEATER MANUFACTURING CO.

HEAD OFFICE FORT HILL SQUARE BOSTON, MASS.

SHOWROOMS NEW YORK-PHILADELPHIA

ENGINEERS' SPECIFICATION INDEX (Continued)

METERS—(Cont'd)

Pitot Tube.

American Blower Co., Detroit, Mich.
Shaeffer & Bundenberg Mfg. Co., Brooklyn, N. Y.

Steam.

American District Steam Co., No. Tonawanda, N. Y.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

OZONE APPARATUS.

Air Conditioning & Engineering Co., St. Louis, Mo.
Ozonair, Ltd., London, England.

OIL BURNERS.

Rotary.

Pennsylvania Globe Rotary Oil Burner Co., Philadelphia, Pa.

PAINT, FOR HEATED SURFACES.

Ric-Wil Co., Cleveland, O.

PIPE.

Soil.

Simmons Co., John, 110 Center St., New York.

Steel.

Pittsburgh Engineering Co., Jeanette, Pa.
Simmons Co., John, 110 Center St., New York

Wrought Iron.

Pittsburgh Engineering Co., Jeannette, Pa.
Simmons Co., John, 110 Center St. New York

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Simmons Co., John, 110 Center St., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING, (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Jenkins Bros., New York.
Simmons Co., John, New York.

PIPE CUTTING AND THREADING MACHINES.

Crane Co., Chicago, Ill.

PIPE, POWER.

Crane Co., Chicago, Ill.
Simmons Co., John, New York.

PUMPS.

Centrifugal.

Alberger Pump & Condenser Co., New York.
American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich
Chicago Pump Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Alberger Pump & Condenser Co., New York.
Nash Engineering Co., So. Norwalk, Conn.
Yeomans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, O.
Chicago Pump Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Hydro-High Vacuum Pump Co., Newport, Ky.
Lebanon Machine Co., Inc., Lebanon, N. H.
McAlear Mfg. Co., Chicago, Ill
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros. Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Healy-Ruff Co. Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS, STEAM AND WATER.

American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Pierce, Butler & Pierce Mfg. Co., New York.
Simmons Co., John, New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, O.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago. Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Wright-Austin Co., Detroit Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mueller, H. Mfg. Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pittsburgh Engineering Co., Jeanette, Pa.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Taylor Instrument Cos., Rochester, N. Y.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, O.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeanette, Pa.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.

SEPARATORS.

Oil.

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Pittsburgh Engineering Co., Jeanette, Pa.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., Inc., New York.
Massachusetts Blower Co., Watertown, Mass.
Seymour, Jas. M., Newark, N. J.

STRAINERS.

Oil.

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Elliott Co., Jeanette, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Wright-Austin Co., Detroit, Mich.

THERMOMETERS.

(Recording and Indicating.)

Bristol Co., Waterbury, Conn.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Taylor Instrument Cos., Rochester, N. Y.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, O.
Fulton Co., Knoxville, Tenn.
Johnson Service Co., Milwaukee, Wis
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dole Valve Co., Chicago, Ill.
Dunham Co., Chicago, Ill.
Heating & Power Appliance Co., Milwaukee, Wis.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.

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Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Simmons Co., John, New York.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill
Heating & Power Appliance Co., Milwaukee, Wis.
Hoffman Specialty Co., New York.
Illinois Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES, (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Spencer Tubine Co., Hartford, Conn.

VALVES.

Air (Automatic.)

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Simmons Co., John, New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Fulton Co., Knoxville, Tenn.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.

Blow-off.

Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

Check.

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Capitol Brass Works, Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Pierce, Butler & Pierce Corp., New York.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Simmons Co., John, New York.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Capitol Brass Works, Detroit, Mich.
Commonwealth Brass Corporation, Detroit, Mich.
Crane Co., Chicago, Ill.
Detroit Lubricator Co., Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Heating & Power Appliance Co., Milwaukee, Wis.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Pittsburgh Engineering Co., Jeanette, Pa.
The Wm. Powell Co., Cincinnati, O.
Trane Co., La Crosse, Wis.
Simmons Co., John, New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Pittsburgh Engineering Co., Jeanette, Pa.
The Wm. Powell Co., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pittsburgh Engineering Co., Jeanette, Pa.
The Wm. Powell Co., Cincinnati, O.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

Stop and Check.

(See Valves, Non Return.)

VENTILATING HEATERS.

American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Probeck Mfg. Co., St. Louis, Mo.
Seymour, Jas. M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

VENTILATORS.

Allen Air-Turbine Ventilator Co., Detroit, Mich.
Arex Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Burt Mfg. Co., Akron, Ohio.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
L. J. Wing Mfg. Co., New York.
York Heating and Ventilating Corp., Phila, Pa.

Mushroom.

Hersh Brothers Co., Allentown, Pa.
Knowles Mushroom Ventilator Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

(See also Heaters, Portable Unit Air.)

WEATHER STRIPS.

Metal.

Monarch Metal Products Co., St. Louis, Mo.

GURNEY BOILERS RADIATORS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
HEAD OFFICE FORT HILL SQUARE BOSTON, MASS. SHOWROOMS NEW YORK-PHILADELPHIA

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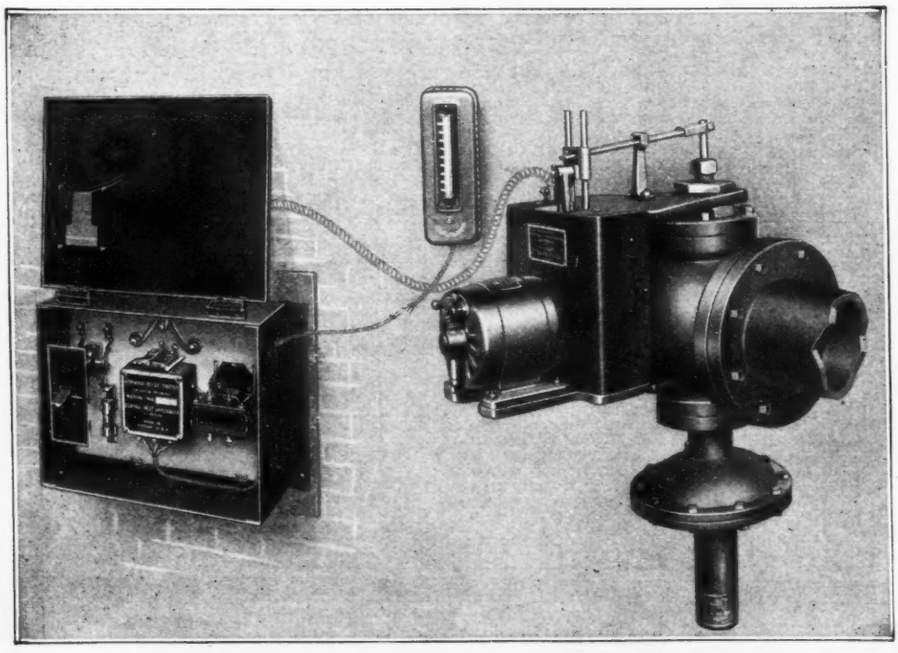
Young Pump Co. 106

Hornung Pressure and Temperate Control Valve



(2463)

CENTRAL HEAT APPLIANCES

343 So. Dearborn St. J. C. HORNUNG, Engineer Chicago

The Southern Minnesota Gas & Electric Co., who serve 65 cities and towns with electricity, gas, and heat, have installed 110 of these Master Controls in Albert Lea, Minn.

WHAT THEY SAY

"We have found these equipments to be highly satisfactory, as they maintain a very constant temperature."

Every Central Station Engineer and Executive—every Heating Engineer and Contractor—knows what that means. Wherever installed, the Master Control prevents waste. A 30% reduction in meter bills is a conservative average.

World's Largest Single Enclosed Space

Heated with Skinner Bros. (Baetz Patent) Heaters

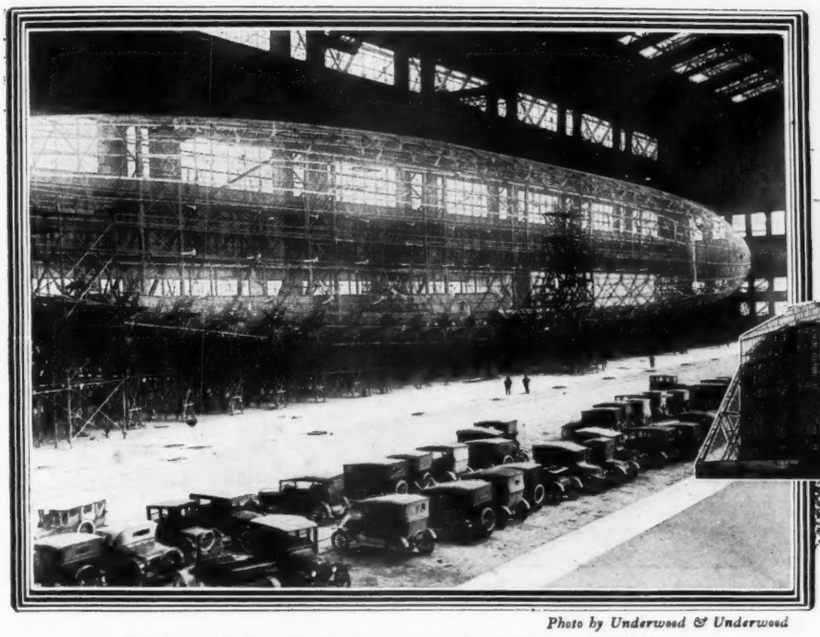


Photo by Underwood & Underwood

This shows the interior of the enormous Naval Hangar at Lakehurst, N. J.— heated with Skinner Bros. (Baetz Patent) Heaters.

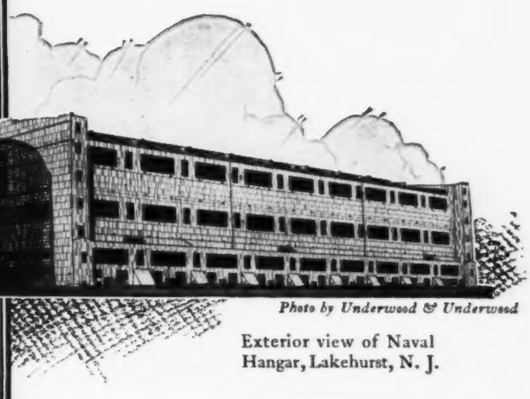
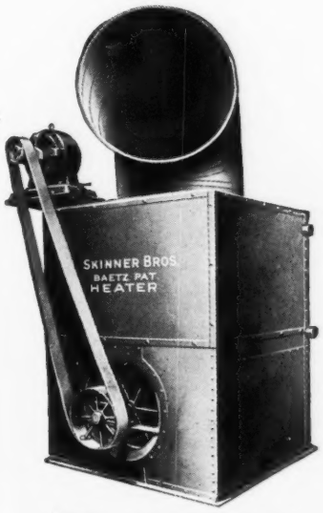


Photo by Underwood & Underwood

Exterior view of Naval Hangar, Lakehurst, N. J.



Steam coil type SC. Uses live or exhaust steam. Where steam is not available, we supply Direct Fired type DF. Burns coal, coke, gas or oil.

The Naval Hangar illustrated above contains 57,000,000 cubic feet of air and is properly heated by only 16 Skinner Bros. (Baetz Patent) Heaters! The significance of this statement will be more apparent when it is pointed out that each of the Skinner Bros. (Baetz Patent) Heaters used is smaller than a Ford touring car.

This is only one instance where the superiority of Skinner Bros. (Baetz Patent) Heater has demonstrated itself—among many highly satisfied users are such firms as General Motors Corp., International Shoe Co., Ozark Theatre, Federal Foundry, Quick Meal Stove & Range Co., Ford Motor Co., United Paperboard Co., and hundreds of others, large and small.

Built on an Entirely Different Principle

The Skinner Bros. (Baetz Patent) Heater is built on a principle totally different from old style apparatus. It uses no pipes or ducts as warm air carriers yet it thoroughly warms every part of the open area in a building. Due to special design, it can also be used as a ventilator and air conditioner—operates economically both summer and winter.

Get full details—ask for catalog B-7 and full list of users.

SKINNER BROS. MFG. CO., INC. Main Office and Factory: 1474 S. Vandeventer Av., St. Louis, Mo.
Eastern Office and Factory: 140 Bayway, Elizabeth, N. J.

Boston, 445 Little Bldg. Buffalo, 702 Morgan Bldg. Chicago, 1703 Fisher Bldg. Cleveland, 612 Marshall Bldg.
Cincinnati, 1050 Hulbert Street, Oliver Schlemmer Co. Wash., D. C., 714 Evans Bldg., U. D. Seltzer Phila., Pa., 1711 Sansom St. Haynes Selling Co.
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Skinner Bros.
BAETZ PATENT HEATING SYSTEM

Kretschmer Manufacturing Co.
Plumbing and Heating Supplies
Dubuque, Iowa

H. C. KRETSCHMER, PRES.
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Nov. 1, 1923

Hoffman Specialty Co.,
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We are having an unusual trade on the Hoffman Air Valve this season and think we have already ordered and sold more Hoffman Valves then we have any previous year. They are certainly giving our trade the best of satisfaction as we have yet to hear our first complaint.

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